The Model Engineer

A Journal of Small Power Engineering.

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Our Point of View

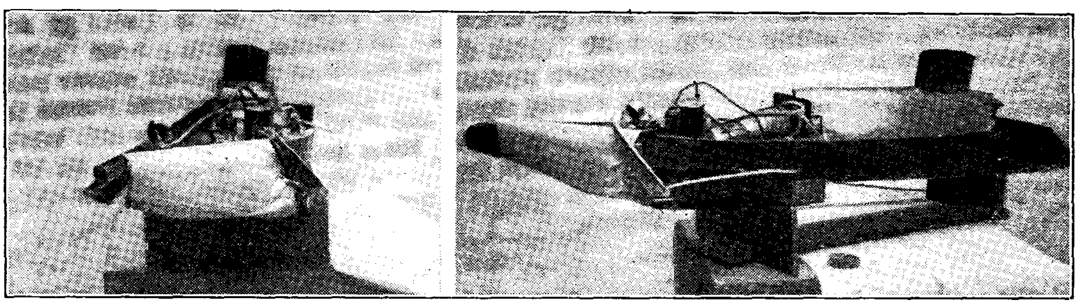
Steering Gear Failures.

Some remarks concerning failures in steering gear transmission systems made by Mr Allman in our columns recently have reminded a correspondent, who signs himself " R.N.,' of one queer breakdown that occurred some years ago on an old battleship, fitted with a line of shafting from the fore bridge to the steering engine in the tiller flat. One day, whilst out with the Fleet, she refused to answer her helm, although the wheel turned freely enough. A hurried change-over was made to the armoured conning tower steering position, and then a careful search was made for the cause of the breakdown, which was found to be a fracture in the hollow shafting just underneath the fore bridge. A bevel wheel was fitted there leading to another steering position, and the salt and fresh water trickling don-n the shaft resulted in a more or less ever-present pool of water forming in the hollow of the wheel, and eventually rusting that part of the transmission shafting completely away, although the walls of the latter were over $\frac{1}{4}$ in. In spite of the considerable length of this shafting and its various branches, the' wheel could be spun round with one finger, owing to the fact that the bearings had all been bored out and then filled loosely with steel balls. For some reason, our correspondent concludes, the shafting from the conning tower had only plain bearings, and it nearly took two quartermasters to work it.

* * *

Those **Petrol** Blowlamps.

Our surmise was correct. The change of address of the Secretary of the South London Model Power Boat Club, recorded on page 53, July 12 issue last, was not occasioned by the unseemly behaviour of " those petrol blowlamps. " The true story, for which we asked last week, reveals the real cause of the trouble, and Mr. Norman Thompson has kindly provided it-the story, not the trouble. It runs :—" With reference to our Editor's query last week, I may say that the ' domestic upheaval ' referred to mas *not* the result of a blowlamp failure. The writer personally tests all his containers to 350 Ibs. per so. in. before putting them into service, because he puts So to 100 tbs. pressure on the fuel when running fast boats. The explosion referred to on page 53 was caused by a too enthusiastic new member, who. in order to get a run with his new



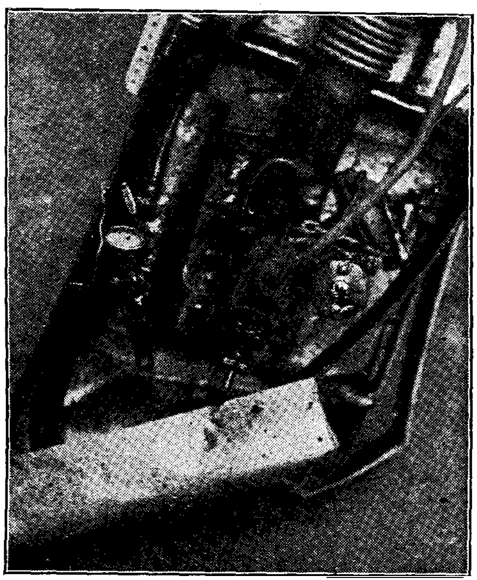
Two views of the Flash Steam Hydroplane, "Sunny **Jim** 111," after her smash at **Brockwell** Park **Lake, when** doing **over** 30 miles an hour.

craft, was in too much of a hurry to make his lamp container properly-the ends, which were a ' fall fit ' in an odd bit of tube, were held in place with about a pound of solder; and no stays were put in, so the inevitable happened, luckily with no damage to anyone except the member, who was in the line of fire. He had to swear off cigarettes for the rest of the afternoon in case he caught alight! "

* * *

Another Smash.

For the illustrations we are able to give on this and the previous page we are also indebted to Mr. Thompson, and to him we tender our congratulations and our sympathy. One of the most remarkable characteristics of the speed



The Flash Steam Hydroplane, **"Sunny** Jim **III,"** alter **hitting** the **bank** at **over 30** miles an hour.

boatman of to-day, as of yesterday, is his cheerfulness in adversity. Had many drivers half the trouble with their cars that these marine enthusiasts have with their hulls and machinery, they would probably pack up and go home by train. This particular smash occurred last week, when Sunny *Jim* III-Mr. Thompson's fast hydroplane-was tuned up, and running at over 30 (we have promised not to say how much over) miles an hour round the pole in an attempt to beat Mr. Noble's record of 32.5 m.p.h., when she pulled the pole over, went for the concrete bank, and-for the rest, see the pictures. Since then the hull has been repaired-replaced would be a more accurate description of the job-and the plant got going again, and her builder is once more cheerfully chasing after forties!

A New Trophy and Some Prizes.

A late item of club news for which we have *no* space in the club columns may here be announced. The President of the South London M.P.B.C. has presented a cup to be competed for yearly. It will go to the fastest boat doing 500 yards round the pole. Mr. N. Physick has put up two money prizes for (1) the fastest pot-boilered boat, and (2) the fastest boat propelled by a commercially-built engine, either bought finished, or assembled from a set of fully-machined parts. Mr. Thompson has also offered two money prizes for steering, one for "flash" boats, and the other for the runner-up in the Club's competition for the *M.E.* Cup. The first heat of the latter event takes place on Saturday next, July 28, at 5 p.m., at Brockwell Park Lake. For the benefit of prospective visitors, we may say the nearest station is Herne Hill, late S.E. & C. Railway.

The Scrap Box.

"I HAVE noticed several single drivers on the L.M. & S. Railway line just lately," says a reader at Nottingham, " the numbers ranging from 635 to 650, so they have not all gone yet."

* * *

A NEW train recently put in service by the Great Western Railway Company is stated to make the fastest regular run in the country It leaves Swindon at 3.45 p.m., and arrives at Paddington at 5 p.m., covering the distance of $77\frac{1}{4}$ miles at an average speed of 61.8 miles per hour. At some points on a trial run, the load behind the engine being over 250 tons, the speed touched 80 miles per hour.

* * *

A MODEL electric launch was running across the Round Pond the other day, when the coupling from the motor to the propellor shaft came adrift. The boat stopped in the middle of the pond. and the owner had the pleasure of listening to the motor buzzing away merrily, while the batteries were running down, and the craft not stirring an inch nearer home. Moral : Always look to your couplings.

* * *

THE Virginian Railway has placed a contract, amounting to £3,000,000, for electrification of the 134 miles of railway running from Rosnoke, Virginia, to Mullen, in West Virginia. The 25-cycle single-phase system has been adopted. working at an E.M.F. of 11,000 volts, and a phase-changer on the locomotive converts this into three-phase current. The electric locomotives are designed to develop 20,000 h.p., and will haul 9,000-ton trains at a speed of 14 miles an hour.

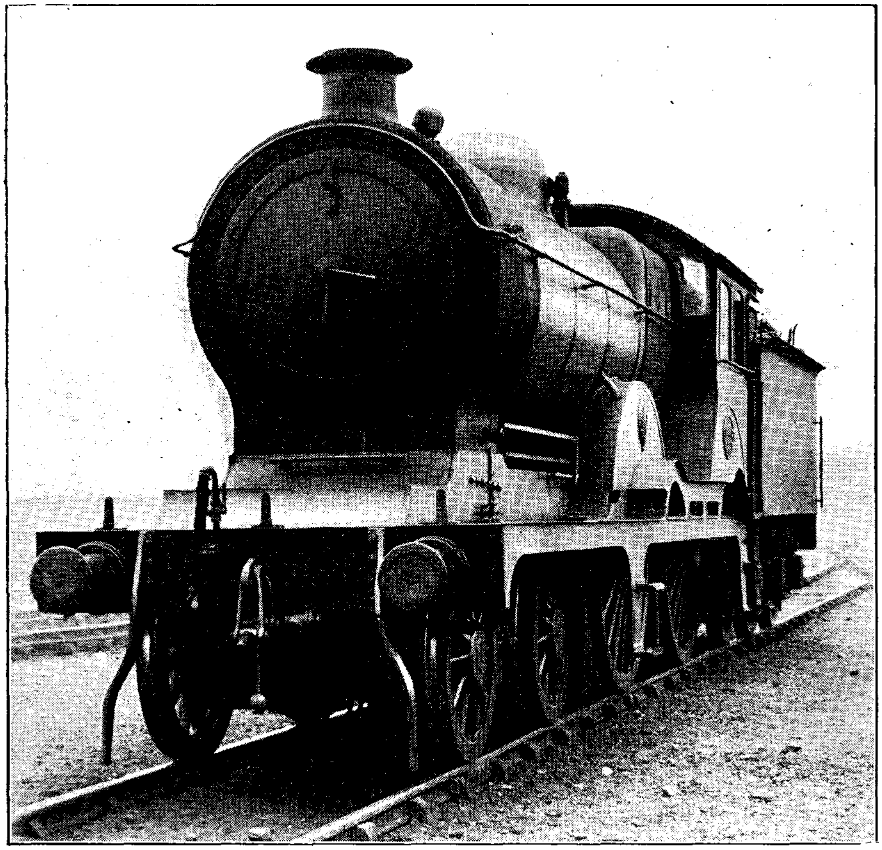
Locomotive News and Notes.

By Chas. S. Lake, A.M.I.Mech.E., M.Inst.L.E.

Improved "Claud-Hamilton" Locomotives—London and North-Eastern Railway.

The 4—4—0 type express passenger locomotives of the "Claud Hamilton" class, designed by Mr. James Hobden, when Locomotive Superintendent of the Great Eastern Railway, and a large number of which have been built since the year 1900 at Stratford Works, have given consistently satisfactory service in working main line passenger traffic on that railway. As in so many other cases, however, increasing loads and the general tendency for conditions to become more difficult, have made it clear that, with increased boiler capacity, the engines would be able to perform even better work than heretofore. Consequently, it has been decided that as they go into the shops for heavy repairs and new boilers are required, some of them, as an experiment, shall be fitted with boilers of larger size, with correspondingly increased heating surface, and one of the engines, No. 1,805, has just recently been returned to service thus equipped

By the courtesy of Mr. C. W. L. Glaze, District Mechanical Engineer, Stratford, it is possible to reproduce herewith a photograph of this engine and also dimensional line drawings showing the proportional characteristics of the class before and after re-boilering. From these it will be seen that whilst retaining the same length of boiler barrel and firebox, the diameter and height from rail of the boiler have been increased, more tubes and boiler elements fitted, and enlargement of the heating surface figures effected.



An Improved "Claud Hamilton" Class Locomotive, London and North Eastern Railway.

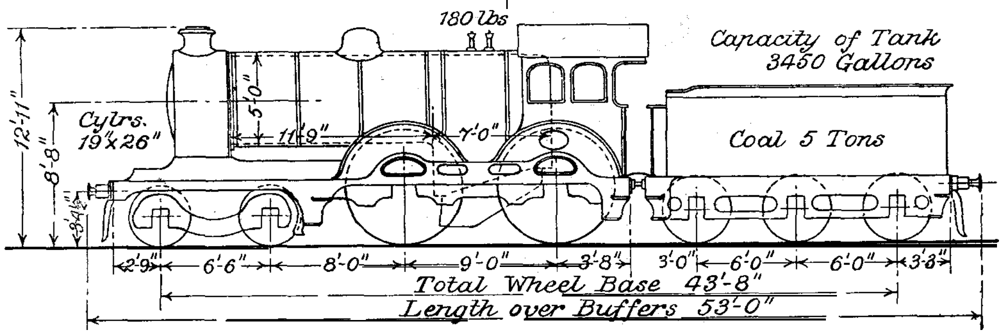
The new and heavier boiler has, as a matter

of course, affected the weight of the engine, with a corresponding increase in adhesive power. The boiler pressure remains as before, but Ross pattern safety valves are now being fitted in place of the Ramsbottom type formerly used.

The following are the leading particulars before and after re-building :—

	Before Re-building.	After Re-building.
Cylinders, diam. ...	19 in.	19 in.
Cylinders, Piston Stroke	26 in.	26 in.
Coupled Wheels, diam.	7 ft.	7 ft.
Wheelbase, Rigid	9 ft.	9 ft.
Boiler, diam. (outside) ...	4 ft. 9 in.	5 ft.
Boiler, Length of Barrel...	11 ft. 9 in.	11 ft. 9 in.
Firebox, Length	7 ft.	, ft.
Boiler, Centre from Rail	8 ft. 5 in.	8 ft. 8 in.
Tubes, No.	158	187
Superheater Elements, No.	18	21
Tubes, diam. (outside)	1¾ in.	1¾ in.
Superheater Flues, diam. ...	5 in.	5¼ in.
Working Pressure	180 lbs. per sq. in.	180 lbs. per sq. in.
Heating Surface :		
Tubes	874.7 sq. ft.	1035.2 sq. ft.
Firebox	117.7 ,,	128.2 ,,
Superheater Flues	282.7 ,,	344.5 ,,
Superheater Elements	154.8 ,,	reo.5 ,,
Total	1429.9 ,,	1688.4 ,,
Grate Area	21.6 sq. ft.	21.6 sq. ft.
Weight of Engine Loaded	52 tons 4 cwt. 2 qrs.	55 tons 10 cwt.
Tractive Power	17,096 lbs.	17,095 lbs.
Adhesive Power	17,272 lbs.	18,593 lbs.

No alteration has been made in the size or



The 4—4—0 Express L. & N.E. "Claud Hamilton" Class Loco after Rebuilding.

capacity of the tender, this being of the six-wheeled pattern, carrying 5 tons of coal and 3,450 gallons of mater with pick up apparatus, when thus loaded weighing 39 tons 5 cwt.

The superheaters are of the "Robinson" pattern, and Belpaire fireboxes are fitted. The engines are classified in the company's books as "D56." The cylinders inside the frames are inclined at 1 in 16. An enlarged type of cab is fitted, and water is delivered to the boiler by a top-feed device, with the clack boxes mounted on the sides of the steam dome.

The engines as rebuilt are known as "Super. Clauds."

Locomotive Weight Distribution.

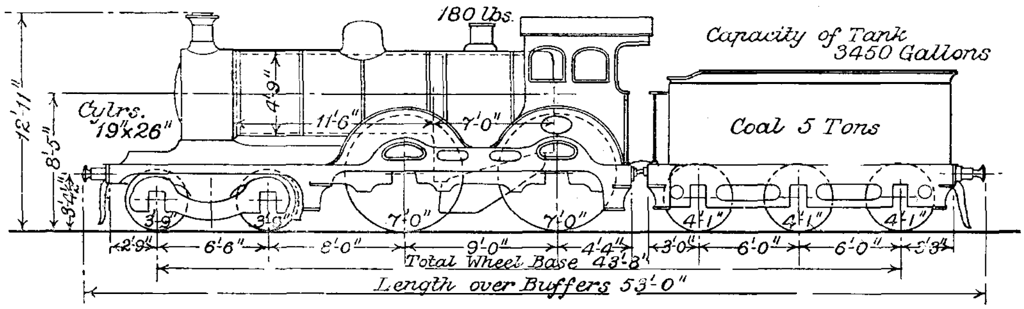
Within limits there is nothing to be gained by building locomotives any heavier than can be avoided, the object being to obtain as much in the way of hauling capacity as is possible, whilst avoiding all unnecessary weight on rail. Now that matters have reached the stage at which in this country the weight problem is causing more thought and anxiety than hitherto, designers are asking themselves what means are available for restricting the tonnage of locomotives without impairing their stability or capacity for work. Efforts are being directed in some quarters to the task of bringing about a reduction in the weight of moving parts, special steels being utilised to make possible a reduction in the sectional area of the rods: Such a system has valuable advantages, but is, we think, hardly necessary as a general measure. As yet railway running sheds and depots are not equipped for handling parts built from special steels, in the handling of which, from the heat treatment point of view, great care and knowledge are required; moreover, unless the engine is of the heaviest and most powerful kind, and called upon daily for the most onerous duties, it is questionable whether any ultimate advantage is to be gained by the special form of construction to which we refer. In other words, these high-grade steels are at present regarded by some as rather in the nature of a luxury not applicable to the fullest advantages to locomotives as a whole, but only to selected types, where real difficulty is met with in connection with the weight problem, and a means of lightening the moving parts has to be found.

Locomotive Tests Between Crewe and Carlisle—London, Midland, and Scottish Railway.

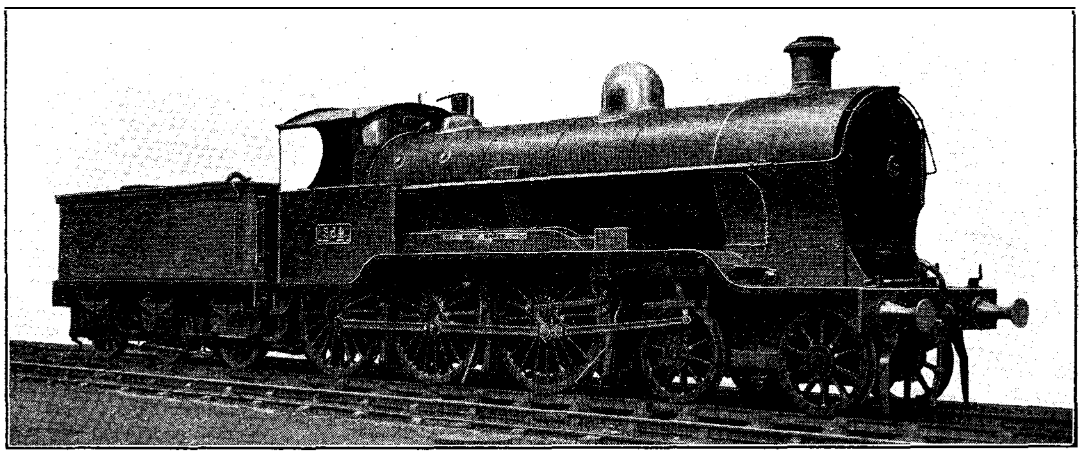
The express passenger locomotives of the "Prince of Wales" class running between Euston and Carlisle on the London, Midland, and Scottish Railway services have given generally excellent results in hauling heavy passenger trains running on both express and slower schedules. They represent an advance upon the original "Experiment" class, in

having superheated boilers and larger cylinders, but otherwise the general characteristics ate the same. A large proportion of the main line passenger train haulage of the system is performed by these locomotives, the principal characteristics of which are given later in tabulated form.

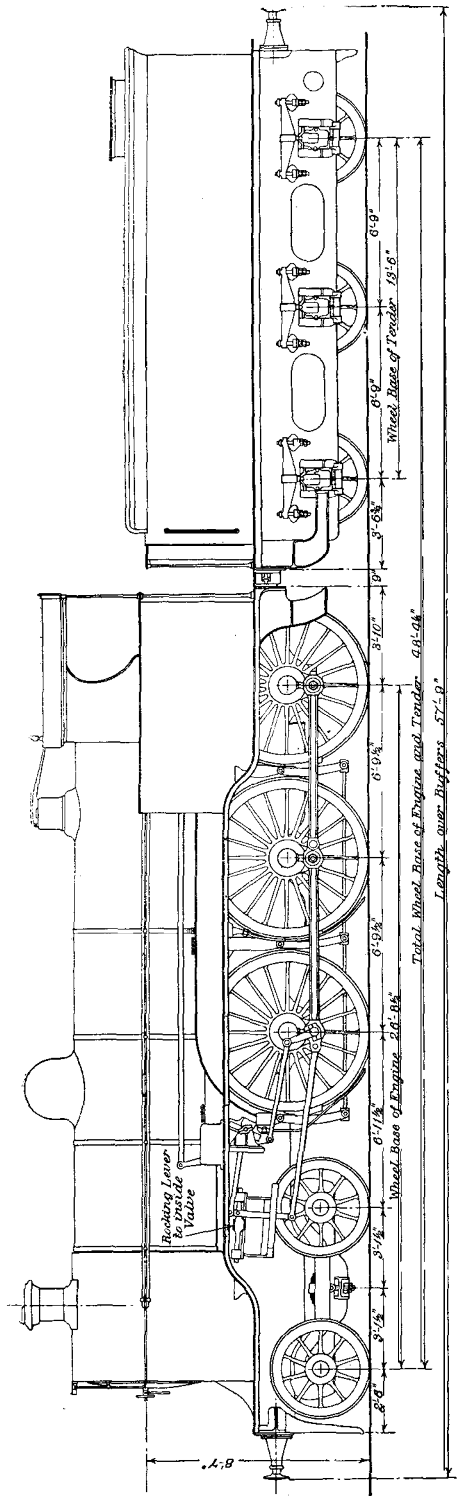
The coupled wheels are of moderate diameter and spaced somewhat closely together, whilst large-sized cylinders are accommodated between the frames, the design being thus a compact one, and proportionally well adapted for the maintenance of high average speeds with heavy trains, owing mainly to good accelerative hill-climbing qualities, and ready accommodation to the curvature of the track, due to the shortened coupled wheelbase. The engines were originally fitted with " Joy's " valve gear, actuating piston valves above the cylinders through the medium of rocking shafts. This arrangement has been applied to a very large number of locomotives built at the Crewe and Horwich works of the London, Midland, and Scottish Railway, and whilst possessing advantages of its own, it is not so generally in favour nowadays as the Stephenson and Walschaerts gears. It has the inherent drawback of deriving part of its movement from a link attachment with the connecting rod, the latter, as a consequence, being drilled to take the pin, and, as was made clear at a recent enquiry into the fracture of one of these rods, at one period of the revolution there may be a downward pull on the rod at the jack link pin hole of at least 2 tons, and in another position this may be reversed. In the official report of the occurrence it was stated that, "having regard to the average steam pressure and to the inertia of the rod itself, and the motion of 60 m.p.h., it may be assumed that the total calculated maximum stress in the rod at the position of the fracture, which appears to have occurred at theoretically the weakest point, is 6.16 tons per sq. in. Assuming the breaking strength to be 34 tons per sq. in., this represents a factor of safety of about 5.5. The corresponding stress on the section at the jack link pin hole, where failures usually take place, is as low as 3.58 tons



The 4—4—0 Express L. & N.E. Rly. " Claud Hamilton " Class Loco before Alteration.



The L.M. & S. 4—6—0 Lcoomotive No. 961, **" Eret Harte."**



Outline Drawing showing Layout of New Valve Gear on the L.M. & S. Locomotive, "Bret Harte."

per sq. in., giving a factor of safety of about 9. As the speed increases above 60 m.p.h., the inertia stresses of the rod and motion, of course, increase more rapidly than the diminution in direct stress due to steam pressure."

In the case of locomotives with inside cylinders, the adoption of Walschaerts gearing is usually regarded as a somewhat inconvenient measure, entailing the use of single eccentrics of increased size and a more or less indirect line of motion. When placed outside the frames, however, the eccentric or "return" crank is conveniently accommodated on the end of the main crank pin, and the gearing is convenient of use, added to which its accessibility for oiling and maintenance represents a considerable advantage. It has not been usual in this country to apply outside valve gearing to inside cylinder engines, but the plan has much to commend it, as it combines the benefits of accessibility with the compactness and steady running of the inside cylinder arrangement, in which the cylinders are set so much closer together.

The arrangement referred to has just recently been fitted at Crewe to one of the "Prince of Wales" class engines, a modified form of Walschaerts valve gear, designed by Mr. H. P. M. Beames, Mechanical Engineer, being utilised. The photographic illustration and drawing, which, by the courtesy of Mr. Geo. Hughes, Chief Mechanical and Electrical Engineer, London, Midland, and Scottish Railway, by arrangement with whom the engine has been equipped, and that of Mr. Beames, it is possible to reproduce herewith, show the layout of the valve motion outside the frames, and from these, as will be noted, the central feature of the design is, that the driving of the combining lever is done from the forward end of the coupling rod, instead of from the piston crosshead, as is the usual practice The motion is transferred to the valve spindle, which is inside the frames, by means of a rocking shaft. This is a simple and convenient arrangement. representing, in the writer's opinion. a real advance upon that previously employed, for the reasons outlined above. The running hoard of the engine has been raised to allow a clearance for the working of the gear, and this incidentally assists in making the side rod lubricators accessible on top centre.

Summarised, the chief objects aimed at in the design *are* :--

1. The accessibility of all motion parts for examination and removal in cases of running repairs.
2. The ease with which the driver and fireman may oil and inspect each part.
3. The elimination of the objectionable hole in the connecting rod from which the valve drive is taken in the case of engines with

"Joy's" motion, thus causing less likelihood of bent rods when valve friction becomes excessive.

4. Decreased maintenance cost, so far as the motion generally is concerned.
5. The advantages of an outside cylinder engine as far as accessibility is concerned, and inside cylinder engine from a steady running point of view.

The locomotive illustrated, No. 964, "Bret Harte," is the first of the class to be thus equipped, and on Sunday, April 22, this engine made a return trip under test conditions between Crewe and Carlisle, with a train comprised of thirteen passenger vehicles weighing 364 tons, and dynamometer car weighing 36 tons, a load behind the tender of 400 tons. The engine and tender in working order weigh 107 tons, so that the gross weight of the locomotive and its train amounted to 507 tons. A glance at a profile of the line between Crewe and Carlisle will show the reader that this is a very difficult route, including, as it does, the famous Shap incline and other grades of varying length and intensity, and bearing in mind the total load and the fact that the tractive effort of the engine does not exceed 22,113 lbs. at 85 per cent. of the boiler pressure (175 lbs. per sq. in.), the performance must be regarded as a highly meritorious one. The total distance is 141.1 miles, and the time occupied on the outward journey was 3 hrs. $27\frac{1}{2}$ mins., including an out-of-course stop made at Oxenholme, owing to there being no water in the troughs after passing Lancaster. The engine had to be nursed somewhat during the accent of Shap on account of tender water shortage before reaching Carlisle. On arrival at the latter station, the water level was only just showing in the bottom of the tender water-gauge glass.

The return journey started at 2.4 p.m., Crewe being reached at $5.29\frac{3}{8}$ p.m., *i.e.*, in 3 hrs. $25\frac{3}{8}$ mins. The maximum speed reached on the outward journey was slightly above 70 m.p.h., and on the return journey 80 m.p.h. Figures indicating the drawbar pull in tons appear on the traction chart, and from this it will be seen that the maximum pull at starting was $16\frac{1}{2}$ tons and a minimum of $8\frac{3}{8}$ tons, the stopping pull ranging from 11 tons to $4\frac{1}{2}$ tons. Slackening of speed occurred by signal at various points, also stops for picking up and dropping pilots on a section over which single line working was in operation. The boiler pressure chart shows that the steam pressure was maintained with great uniformity during the bulk of the trip, ranging for the most part from 170 to 180 lbs.

The "Prince of Wales" class engine has main particulars as follows :—

Cylinders, diameter, $20\frac{1}{2}$ ins.
Cylinders, piston stroke, 26 ins.
Wheels (bogie), diameter, 3 ft. 9 ins.
Wheels (coupled), diameter, 6 ft. 3 ins.
Wheelbase, rigid, 13 ft. 7 ins.
Wheelbase, engine, 26 ft. $8\frac{1}{2}$ ins
Heating surface—
 152 tubes, $1\frac{7}{8}$ ins. external diameter, 969.9 sq. ft.
 24 tubes, 5 ins. external diameter, 405.9 sq. ft.
Firebox, 135.8 sq. ft.
Total heating surface of boiler, 1,511.6 sq. ft.
24 sets of superheater tubes, $1\frac{1}{8}$ ins. internal diameter, 304.4 sq. ft.
Total heating surface, 1,816.0 sq. ft.
Boiler pressure, 175 lbs. per sq. in.
Grate area, 25 sq. ft.

The engine in working order weighs 56 tons 5 cwt. 0 qrs., and the tender in similar condition 40 tons 15 Cwt. 0 qrs., a total of 107 tons. The engine develops a maximum tractive force of 20,812 lbs. at 80 per cent. of the boiler pressure, and 22,113 lbs. at 85 per cent. The tender is of the six-wheel pattern, and has a water capacity of 3,000 gallons and a fuel capacity of 6 tons.

Inlaying with the Lathe.

By G. A. Grace, B.A.

INLAYING by means of the lathe is by no means new, but all such work executed in the past by the lathe has been merely a haphazard set of insertions lacking any evidence of intended design and possessing no artistic merit in consequence.

Designs of remarkable beauty can now be inlaid, and by the wish of the Editor I am putting before the readers of the *M.E.* a series which can be as readily executed, if need be, on a metal turning lathe as on an ornamental.

All the designs are original, and the result of much time and thought devoted to this subject.

Fig. 1 is a ring stand in blackwood inlaid with a design in ivory, and was exhibited at the 1912 Turners' Exhibition at the Mansion House, in London, where it gained the second prize.

Only a few accessories are needed for the work, and after enumerating these, we will at once proceed with a description of the sequence of operations necessary to effect this pattern on the base of the stand, Fig. 1, and which is shown more clearly in Fig. 3. When once a grasp of the method is obtained, it will be quite easy to execute any of the designs shown in succeeding articles, and also for the operator to originate others for himself.

As some readers may hesitate to undertake this work on a metal turning lathe, I will mention that the ring stand was inlaid upon such a lathe, and that he need not fear that he

will be placed at a disadvantage if he has not an ornamental lathe at his command.

We will now go into the matter of the few accessories necessary for the work. A lathe, whether it be intended for metal or ornamental work, is very limited in its action without an overhead, and this is essential in this work in order to drive the cutting-out instrument known as an eccentric cutter.

A divided headstock, with for preference (but not absolutely essential) a 360 circle of holes. Failing this 180 would be the next best. It is not always possible to get a circle of 360 holes on the face of a metal lathe pulley. A pointer to arrest the headstock at any desired position is needed so that the eccentric cutter can operate upon the work. There are several ways of constructing these. Preference should be given to one which is adjustable as to its length, so that it will be within the power of the operator to effect very slight adjustment of the work to the eccentric cutter, when carrying out the sequence of operation for the inlay. This power of adjustment makes for perfection in this work, and the want of it would be a serious handicap to anyone, and disappointing results would follow.

Some form of stop to the upper slide of the rest is required in regulating the depth of cut for the eccentric cutter so that there may be uniformity of depth throughout.

The eccentric cutter alluded to excavates the work for the reception of the circular discs by which the patterns are effected. These recesses are greater or smaller in diameter according to the radius of the tool in the head of the instrument.

The eccentric cutter is one of the instruments in use with an ornamental lathe, but it can be used with equal satisfaction for this work in the slide-rest of a metal-turning lathe.

It is necessary to have a piece of packing material to bring the eccentric to the precise height of centre.

This is very important. Trouble taken with this requirement will be wed compensated by the result shown in the working of any of the patterns, as any deviation, however slight, from correctness in this respect will be at once apparent to the eye when the work is finished. As it is not easy to judge whether the axis of the eccentric cutter is the same height from the bed of the lathe as the lathe axis, a few words as to how to secure this may be of service.

The easiest way to make the two axes coincide is to turn in the lathe a small recess of say $\frac{3}{4}$-in. diameter in a boxwood chuck. Set the eccentric cutter with a chisel-shaped tool on it (Fig. 2) to cut a recess of similar diameter, place the instrument in the slide-rest and bring it into position over against the small recess cut in the chuck, and note what adjustment is required *in height* to make the other edge of the cutter coincide with the edge of the recess in the work. When once the right thickness of packing material is found, all future difficulty is avoided by keeping it for this special purpose.

With regard to the cutter used for this work of inlaying, it is rectangular in shape and bevelled off at each side and ground in front like a miniature chisel (see Fig. 2).

These cutters are so small as to require for convenience an instrument called a Goneostat to hold them when being sharpened. One easy to make will be shown in a future article. One or two brass cup-chucks of about 3 ins. diameter are also needed.

A working description will be given later of the various accessories, as detailed above, most of which any amateur can make for himself.

We will now, before proceeding with the inlaying of a design, mention the materials necessary for the work.

Blackwood and ivory are the most useful. If further colours are desired, boxwood, tulipwood, greenheart, green ebony, will supply what is wanted.

There are many other beautiful woods besides those mentioned, but very difficult to obtain, and it is hardly worth while to enumerate woods that cannot be procured.

It would be well to buy for a start a piece of 3 ins. diameter blackwood to inlay, and an assortment of quite small pieces of blackwood to inlay with. Some small pieces of ivory, such as old billiard balls and other oddments, will save buying ivory in the tusk, if need be. The only precaution necessary in using this small ivory is to see that the work can be finished with the piece being used from, as another will be certain to be of a different shade and be detrimental to the general effect. When the converse is the case, and ivory is inlaid with blackwood or other material, it is imperative that the ivory used in the course of completing the design should be from the same tusk as the piece which is being ornamented was cut from.

Provide some blackwood, say 3 ins. diameter, and a small quantity of pieces which will turn up from about the size of a pencil to half an inch or more diameter. Some boxwood, 3 ins. or 4 ins. diameter, for chucks will complete the requirements for a start.

We will now proceed with the inlaying of the design on the base of the ring stand, Fig. 1, as shown in plan, Fig. 3.

The size of the base may suitably be about 3 ins., and a recess should be turned in it suitable for the bottom of such a stand. It is convenient to place the work in a three-jaw chuck for this operation. When this side is finished it is removed from the three-jaw, and a boxwood chuck is next prepared to receive it.

As a good deal of the success in the working of the patterns turns upon the right kind of

boxwood chuck we must take a little trouble in this matter.

Boxwood chucks mounted direct on to the mandrel nose, however well fitting, are not satisfactory for this work, as they cannot be relied upon to screw up to the identical position on the nose each time the work is replaced.

And as this is essential, it is necessary for the boxwood to be screwed or driven into brass or gun-metal cup-chucks. A metal chuck is not liable to the variation in position on the lathe nose which a wooden one is addicted to. A wooden chuck not inserted in a cup or some form of metal receptacle to hold it is bound to bring disappointment to the operator, as the work, taking different positions on the nose of the mandrel each time it is screwed up to be

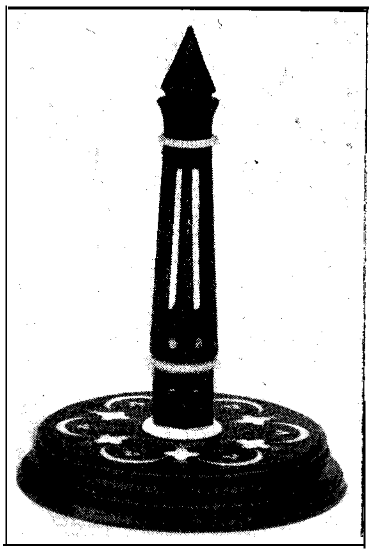


Fig. 1.—A Ring Stand in Blackwood, Inlaid with Ivory.

operated upon, will not be in truth with the operations which have previously been performed, and the inlays, if they be crescent moons, as in Fig. 3, will have the points at unequal distances from the centre of the work. Some form of chuck therefore to mount the boxwood on is necessary. An alternative form to the recognised cup-chucks, and which has much to commend it, is shown in Fig. 4. The boxwood in this case is faced and a recess turned in it, and is fastened to the metal chuck by three short screws.

Having by means of a cup or flange chuck fastened a piece of boxwood, it must now be turned to receive the blackwood base already prepared.

To ensure the base being mounted concentric with its first chucking, a small shoulder may be formed so as to enter the recess made in thh blackwood base.

This if it fits without shake will ensure concentricity. Apply a small quantity of cold liquid glue (such as Le Page's) to the flat portion of the blackwood base, taking every precaution that none enters the recess, so as to ensure ease of detachment when the work is required to be severed from the chuck. In gluing the base it would be best to aim at not allowing the glued portion to advance nearer than say ⅛ in. from the recess formed. The base is now pressed upon the chuck with a slight screwing-motion

Fig. Z.--Chisel-shaped Tool for Eccentric Cutter.

so as to ensure as close a contact with each other as possible.

If cold glue is used the work may be faced up ready for the first operation of inlaying in about an hour's time. Having faced up the work we will proceed with the six large outer crescent-moons of the pattern, Fig. 3

To get these six crescent moons into position it will be necessary to proceed as follows. It will be noted that the moons are not in contact with each other, and that a space is left between each. The width of this space is approximately half that of one of the large crescent-moons, or 1-18th of the circumference.

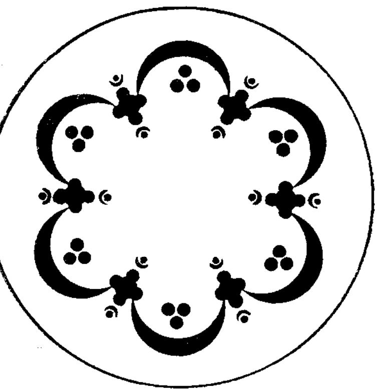


Fig. 3.-Design for the Base of the Ring Stand.

If therefore the work be divided into 18 parts, a large crescent-moon will occupy two parts; and what we may call the conventional earwig portion of the design, one part. Six crescent-moons and six conventional earwigs will complete the design. The best and safest way of getting the correct proportion for the moons, and the spaces left for the earwigs, would be to engage the dividing pointer in the 360 division on the plate, or the 180, if that is the largest available circle of holes, and to draw the scribing-block pointer (having fixed it at exact centre height) lightly across the work so as to leave a line plainly visible, and to repeat this operation

of drawing the pointer across the work after moving the pointer a sufficient number of divisions to divide the work into 18 parts. That is, on the 360 circle every 20 holes, or 10 on the 180 circle.

We have now 18 lines on the work, representing its equal division into that number of parts.

Any two divisions represent the space a crescent-moon will occupy, and one division the space to be left for subsequently inlaying the earwig portion of the pattern. It should be noted, however, that if the crescent-moons occupy precisely two divisions, then the earwig portion will be obliged to take up rather more than one division, because this small design is wider than the distance of the adjoining points of the crescent-moons. The best arrangement is to make the crescent-moons overlap the two divisions of the work somewhat, so that the earwig design takes up 1-18th or even less.

We will now proceed to arrange for the eccentric cutter to do this. Place the instrument in the slide-rest at right angles to the work, the chisel-shaped tool, Fig. 2, being in the tool-has, and adjust the radius at which the instrument will cut, so that the outer edge of the cutter would, if the work were excavated by the instrument, cut precisely between any two divisions that have been marked upon the work. The pointer, of course, should be in engagement with the division plate in doing this.

Crescent-moons cut with this adjustment would, as we have seen, allow more than 1-18th to the width of the earwig portion of the design. The radius of the eccentric cutter should therefore be increased somewhat. The extra amount will depend upon the size of the dot inlays which will be used to form the earwig part of the pattern.

As the size of these will depend somewhat upon the distance of the crescent-moons from the outer edge of the work. the nearer the crescent-moons are to the centre of work, the less wide will the earwig pattern be ; exact measurements therefore cannot be given. This does not matter, as judgment by the eye will guide the operator perfectly in this. I may say that about $\frac{1}{2}$ or $\frac{3}{4}$ of a turn of the ten-thread per inch screw of the eccentric cutter. adding that much extra radius, will be about right.

Having made this adjustment we will begin the first of a series of cuts into the work to form the six crescent-moons.

The dividing pointer is assumed to be in the 360 or 180 division on the headstock. It will now be necessary to drive the eccentric cutter by means of the overhead, and to allow the tool to penetrate the work to about $\frac{1}{8}$ depth. and to fix the depth stop, so that the subsequent cuttings for the other inlays are to the same depth. When the tool of the eccentric cutter has penetrated to the desired depth we have a narrow channel cut in the work, the width of the cutter ; the tool is withdrawn from engagement with the work, and the dividing pointer is removed to engage with the 60 (or 30 if dividing by the 180 circle). The eccentric cutter is made to repeat the same operation as the first, and to continue this operation with the pointer removed 60 (or 30) divisions until the 6 excavations are made.

We now reduce the radius of the eccentric cutter by a little less than the width of the tool. If the tool is 1-10th inch wide (and it should not be more) the screw of the eccentric., which has usually ten threads per inch, would be turned a bare whole turn, and the cutting proceeds as before. Further reductions are

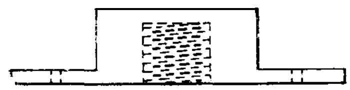


Fig. 4.—An Alternative Form to the usual Cup-chuck.

made in the radius of the tool until the whole of the portion left standing from the first cut has been removed, and six circular recesses are left in the work (see Fig. 6).

The eccentric cutter can now be removed, as the six recesses will require corresponding inlays in ivory prepared for therm.

We will now proceed with these. There are three ways by which they could be prepared: (*a*) with the eccentric cutter , (*b*) with a tool mounted in slide-rest ; (*c*) by hand-turning tools. The first takes the longest time, and is almost impracticable. It is only mentioned to safeguard the operator from attempting it The second is quite practicable, but misfits are much more likely to occur than with the tee-rest and hand-turning chisel and gouge. The gouge is only needed if the material has angular corners

Fig. 5.-A Cutting-off Tool made from Hacksaw Blade.

to be quickly reduced, otherwise the chisel and parting tool alone are required. The chisel most suited to this work is one 5-16th in. to $\frac{3}{8}$ in. wide with the cutting edge ground on both sides. The cutting-off tool should be as thin as possible, for economy in material and ease with which it will do its work. I have made extensive use for this purpose of used-up hacksaw blades with the teeth ground off, and formed to the shape shown in Fig. 5 and mounted in a handle.

The ivory for the inlays can be suitably held in a three-jaw chuck and reduced to near the size required ; it should be repeatedly tried for fit with the recess in the work it is intended to occupy, in which it must fit in such a way as to require a slight pressure to insert it. A loose fit, in which glue is solely trusted to keep it in place, is undesirable. In fitting these

inlays, each one must he fitted separately to the recess it is intended to occupy. Any attempt to turn the whole piece to size, and then cut off half a dozen, will not meet the degree of accuracy required in this work. The inlay must also he turned so that there is no perceptible taper to the eye. Having 'reduced the portion at the end of the work to such a fit as has been described, it is now necessary to cut off with the parting-tool just sufficient to ailow the inlay to stand out just above the face of the work when inserted and glued in.

If more is left, and the inlay stands considerably above the face of the work, there is always a risk when facing the work up before the next operation that some edge may splinter in such a way as to leave an indentation in the circumference of the inlaid disc. There is no possibility of this if the inlay is cut off so as only to just stand above the surface of the work.

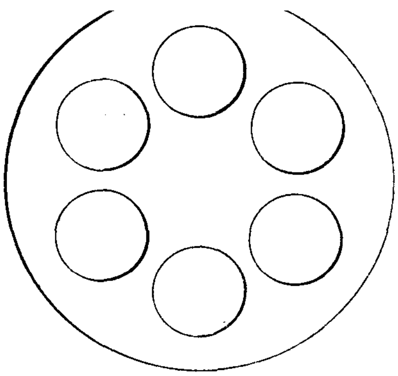


Fig. B.-The first operation : Six Recesses Cut in the Blank.

Having prepared all the six inlays, it is next necessary to glue them in.

The only precaution necessary in gluing is to have the glue very thin, and to use the least possible amount. The most suitable brush is a short Rat one about $\frac{1}{8}$ to $\frac{1}{4}$ inch wide. The recesses of the work are best glued, not the inlays, as the operation can be got through without glueing the fingers, and these in turn the face of the work.

Having glued in all the six inlays, the work should stand over till next day if possible, and is then faced up, only removing the outstanding inlays with the barest scrape of the original surface.

We shall now require the eccentric cutter to be placed in the slide-rest to re-cut out nearly, but not quite all, of the inlays just inserted so as to form the crescent moons To do this the eccentric cutter should be set at the same radius for cutting as at the first, and the pointer in engagement with the same divisions as before ; all the settings and procedure are identical with the first, except that the eccentric cutter will this time operate about 1-10th or less nearer the centre of the work. The amount of difference is left to the operator to judge by eye, which he can easily do if the head of the instrument is turned round slowly by hand.

The eccentric cutter, if correctly placed at centre height for the first operation, will now again be instantly adjusted to this height by the packing piece already provided.

In the case where an ornamental slide-rest is in use with the usual elevating ring, the position of this ring may for convenience be known so as to readily place the eccentric cutter at the precise centre height, as in between the sequence of inlaying the slide-rest may frequently require alteration to bring other instruments to the requisite height for other work.

The correct height of the instrument being thus ensured for each successive operation, no further thought need be given the matter. The work when attached to a metal chuck now

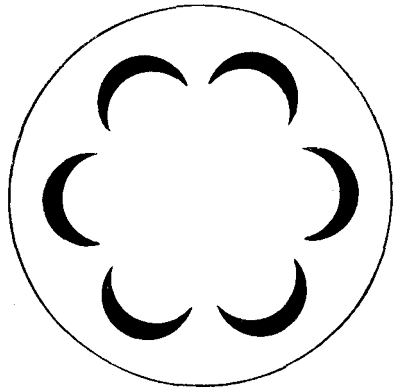


Fig. 7.—The Ivory Crescents Inserted.

returns to its first position, so that no variation need be apprehended on that account to upset the correct position of the pattern.

We will now suppose that the six recesses are again made in the work as at the first. The form of the six crescent-moons will be now apparent. The recesses require fitting in with six blackwood inlays in the way previously described for the ivory inlays in detail. The blackwoocl inlays having been glued in and faced-up, the work will now present the appearance shown in Fig. 7.

The next part of the pattern to be proceeded with is the formation of the six earwig designs between the points of the crescent-moons. The body of the ornament is formed of five inlaid dots, four of which are separated from each other so that they can be inserted at this operation. We can also at this stage inlay two small dots, one at each end of the body, to form the miniature crescent-moons, a matter of six inlays for each of the six earwigs, making 36 altogether.

In addition to this, the three small dots forming a triangle in the centre of each crescent moon, can be got on with, making a further

18 **recesses.** We can, of course, prepare all these recesses by very small cutters in the eccentric, hut if a drilling spindle is available, it is desirable to use this in preference to the eccentric cutter. The recesses for the dot inlays, which are situate at the points of the crescent moons, should be first cut out.

It is not to be anticipated that any division on the dividing plate mill give the required position exactly central to the point of the moon. The adjustable index pointer is lengthened and shortened to do this, and one recess having been located aright, five others will be rightly placed by engaging the pointer at each sixtieth division from the start. 'The recesses for the dots at the other points of the crescent-moons are worked in precisely the same way, the first recess being located by a suitable compensation of thr pointer, and the other five by dividing as before on the division plate.

The other two dot recesses of the earwig body,

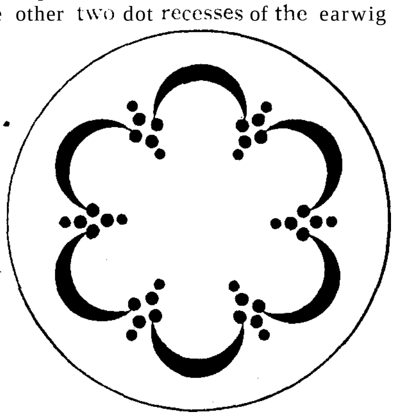


Fig. S.-The **design completed** with Ivory Inlays

which can be worked at this stage, merely require the correct location of one of each six sets, and the others fall into place by dividing six equidistant divisions on the dividing plate.

The twelve recesses, smaller in size. for the 17 crescent-moons at each end of the earwig body are located in the same way. It will save trouble at the nest operation if a note is made of the divisions used on the dividing plate. If there is no micrometer on the pointer the dots forming a triangle inside the crescent-moons had better be left till the next operation, as the pointer may be espectcd to rcyuire the present setting altered in working these, but the correct location is again found as before described, that is, one dot is correctly found by suitable compensation of the index pointer and the remaining five of each set fall into a corresponding position by dividing on the plate.

All the recesses norked will require ivory inlays fitted and glued in, and when the work is again faced-up it will present the appearance shown in Fig. 8, which omits the dot triangles inside the large crescent-moons.

We have now to work the inlays which complete the bodies of the earwig design; there are six required, and if the index pointer has not been altered as to its length from the previous operation centrality is assured by engaging the pointer in the same division previously noted at the last operation. Likewise the setting is correct for the formation of the small crescent-moons, and when the inlays are inserted and the work again faced up, 'it is ready for the *minute* dots in the *crescent-moons last* formed. The position of these is ascertained for the first of the series, and the remainder will fall into their respective places on the pointer being engaged at every sixtieth division.

If the dot triangles in the large crescent-moons have been left over from the last operation they must be worked as previously described.

The design as shown in Fig. 1 is now complete. The work will require to be faced up with a carefully-sharpened tool. The best result is obtained by one of rectangular shape, like a chisel, and not, as might be supposed, a round-nosed one, for however carefully the latter is used it will leave uneven markings on the face of the work.

With regard to sandpaper, the very finest procurable n-ill be too coarse and scratch the surface and do more harm than goad, but if the finest sandpaper is worn so that its cutting power is almost gone it may with advantage be used. A handful of shavings or the hand placed against the work as it revolves quickly in the lathe will produce a friction polish which is all that good taste requires. The operator may be tempted to the use of oil. This is not good for the ivory, but if the inlaying is carried out with some other substance than ivory, such as light-coloured tulip wood (on no account use dark tulip wood, as the contrast is lost) or boxwood, both of which can be thoroughly recommended, a drop of oil may be advantageously used.

The work now, with the design completed, only requires severing from the chuck, unless it is intended to form a recess (either plain or screw) for the attachments of some centre-piece to form a ring or watch stand, etc., in which case this must be first prepared for, before the work is detached from the chuck.

When this has been carried out all that is required in order to remove the work from the chuck is to use a narrow parting-tool in the slide-rest, making the tool enter the chuck so as to just miss touching the blackwood base. The base will come away with the glue and possibly a film of boxwood adhering to it, which can be quickly and easily removed with a damp sponge judiciously applied.

Having completed the design shown in Fig. 1 it will now be shown how the design can be so altered as to appear to have no connection with Fig. 1.

(To *be continued.)*

Some Steam Models.

By H. S. Bond.

In giving some photographs and descriptions of a few models I have made, I am hoping to interest some at least of my fellow readers.

Being, unfortunately, a fitter by trade, I do not claim to have accomplished anything extraordinary, although the class of engine I have been accustomed to is far removed from models. Neither are the conditions under which I work ideal for model-making, having no lathe, and condemned to spend my spare time in "digs." However, these difficulties are not insuperable, as, fortunately, I can use a friend's lathe occasionally, and have fixed my vice to an old trunk. By being careful to clear up everything, so far there has been no court-martial for "bits" on the bedroom floor!

I have been keen on "model" (?) making from my youth upwards, progressing from the

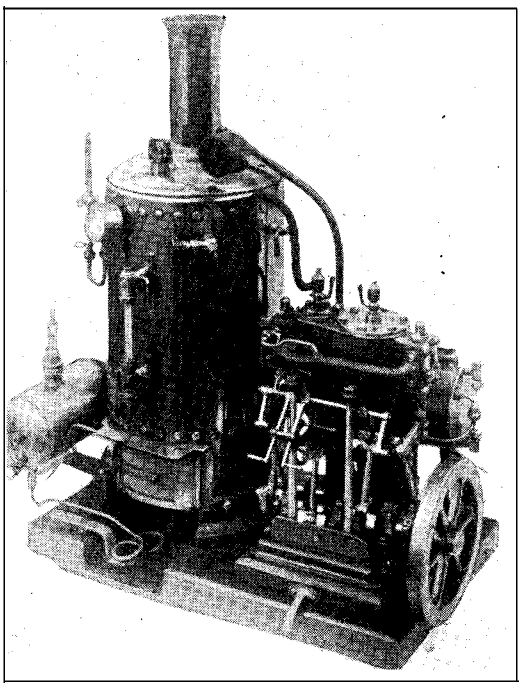


Fig. I.-The Model Compound Engine and Boiler.

inevitable treacle tin and candle, in the usual way. Leaving these early tragedies, which mostly found a happy release in the dustbin, I will proceed with some account of those made after serving my apprenticeship.

The largest engine is a compound, non-condensing (Figs. 1 and 2), closely resembling the class of engine found in tugboats. The cylinders are brass castings obtained from Stevens' Model Dockyard, bored out to ⅝-in. H.P., 1-in. L.P., stroke 1 in.. steam ports drilled and cut in the usual way Circular turned covers are fixed by 3-32nd-in. studs and nuts to the steam chests, to facilitate setting the valves. The valve rods project through top and work in bonnets.

The standards and bedplate were cast locally, in gunmetal, to my own patterns.

The crankshaft is turned from the solid with counterbalances filed up from scrap, bolted on

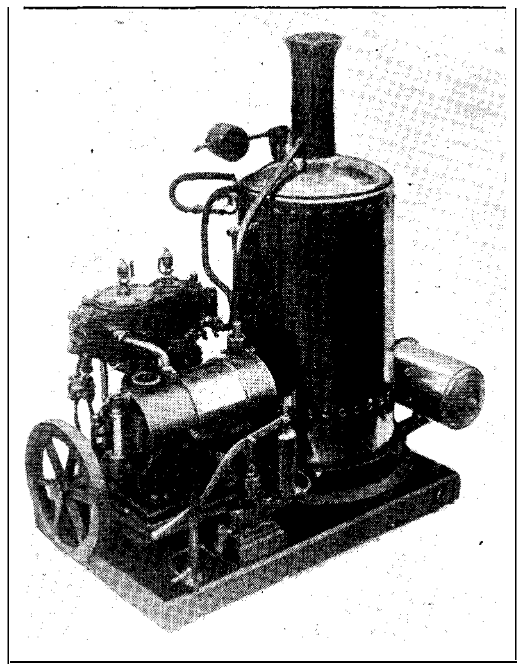


Fig. 2.-Back View of the Model Compound Engine and Boiler.

Stephenson's link motion; hand levers, weigh shaft levers, drag rods, and eccentric rods are filed up from steel scrap.

The two largest hand levers work the reversing gear and throttle valve, and the three small levers work the cylinder drains and L.P. impulse valve. A cast iron flywheel is keyed to shaft, which is supported by an outboard bearing. Connecting rods are steel, with phosphor bronze top and bottom ends screwed on. The engine exhausts into a brass tank bolted to the back of engine, and this warms the feed-water, which is pumped to boiler by a hand pump.

The boiler is 5 ins. diameter, 9 ins. high, drawn copper 3-32nd in. thick. It has copper-flanged ends, riveted in; thirteen ½-in copper flue tubes, and the whole thing is silver-soldered, The steam pipe is led into the smokebox with the object of drying the steam. All the fittings with the exception of the safety-valve were pur-

chased from Stevens' Model Dockyard. With reference to the safety-valve, I may remark that, after experimenting with two or three spring-loaded valves, I came to the conclusion that a dead-weight valve was the most reliable. This blows off at 80 lbs., and boiler is tested by gauge to 150 lbs.

Steam is raised by a loco-type silent primus burner, obtained from Bassett-Lowke, Ltd.

The whole outfit gave me great pleasure to build, and is a very satisfactory engine to run. The boiler steams well, and I have had the engine driving a small dynamo, and find that at 60 lbs. and over the L.P. more than justifies its existence, for if the drain and lubricator cocks are opened a very noticeable falling off of power is the result.

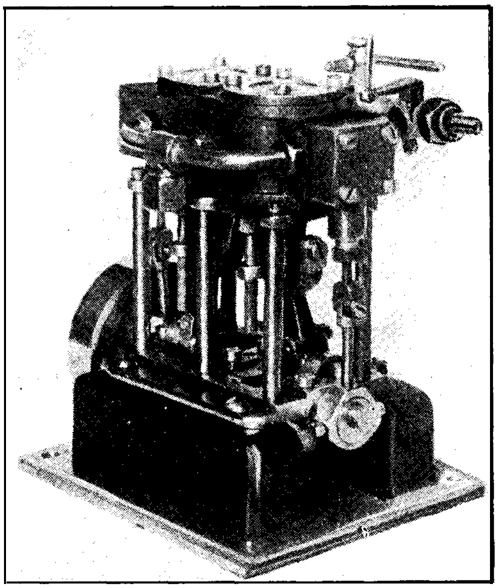


Fig. 3.-The Twin-Cylinder Launch Engine ; Starboard Side.

Twin-Cylinder Launch Engine.

The engine I am most proud of is the small twin-cylinder launch engine (Figs. 3 and 4). It is, I think, a little out of the ordinary, and it is the smallest engine really capable of real work that I have seen. Its leading dimensions are : Double-acting slide valve cylinders, $\frac{1}{2}$-in. bore, $\frac{1}{2}$-in. stroke, travel of slide valves 3-32nd in. ; height from bottom of bedplate to top of cylinder covers 2 3-16th ins. ; length over steam chests $2\frac{1}{4}$ ins. ; width over columns 15-16th in. ; extreme width of bedplate 1 7-16th ins. ; length of bedplate $1\frac{3}{4}$ ins. ; diameter of flywheel $1\frac{1}{4}$ ins. ; connecting rod centres 15-16th in

The idea was to see how small and compact I could make the engine'. The cylinders were made first and built up of brass tube ; valve faces pinned on, top and bottom plates fixed by shouldering down the cylinder tube and beading over ; the whole thing being then sweated. A 5-32nd-in. balanced crankshaft is built up, and pinned and silver-soldered. The bedplate is filed up from +-in. brass plate. The glands are separate and are screwed into bottom cylinder coverplate and steam chests. The columns are

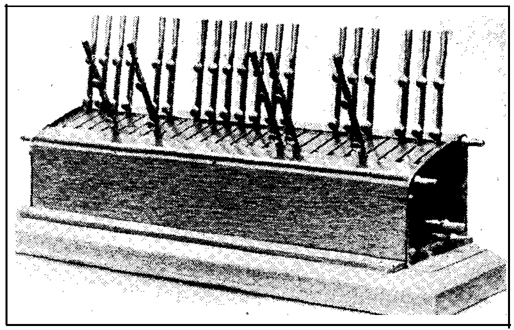


Fig. 7.—The Signal Lever Frame : Front View.

$\frac{1}{8}$-in. brass rod, 13-16th ins. long. The strap of gib and cottar type is used to save spare at bottom ends. It is screwed to steel top end fork of the connecting rod. And here must be noticed the unusual shaped crosshead, which is made from a solid piece of steel, and was perhaps

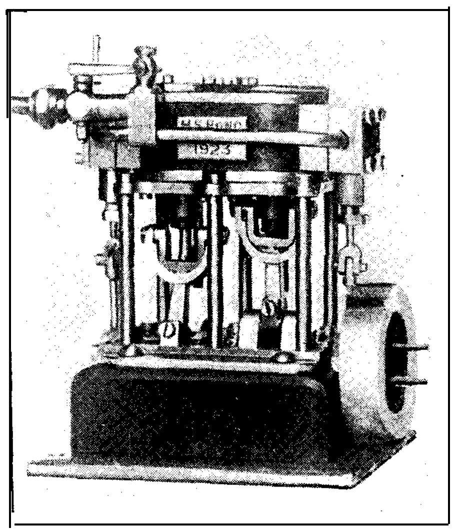


Fig. 4.-Twin-Cylinder Launch Engine : Port Side.

the most troublesome part to make. The back has a projection which works on a round guide-bar. By making the crosshead this shape 5-16th in. was saved, giving a longer connecting rod, which will be noticed exceeds $1\frac{1}{2}$ rimes the stroke, and brings the height of the cylinders down.

A lubricator was fitted to the steam pipe, but looked so unsightly that I substituted the smallest cock I could obtain

The engine is mounted on two ebony blocks and a brass plate. I may eventuallv fit it in a model launch, as it develops a surprising power with 30 lbs. of steam, whilst with 10 lbs. it will

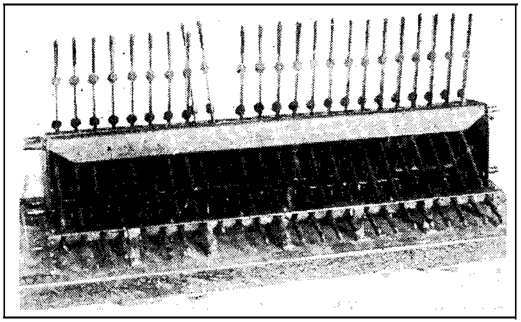


Fig. S.-Signal Lever Frame : Back View.

spin round at a very comfortable speed. Its weight, not including ebony blocks and plate, is exactly $9\frac{1}{2}$ ozs.

Enclosed Single-Acting Twin.

The twin enclosed single-acting engine (Fig. 5) has cylinders $\frac{3}{8}$ in. by $\frac{3}{4}$ in. The only casting used for this is the flywheel—a survival of my

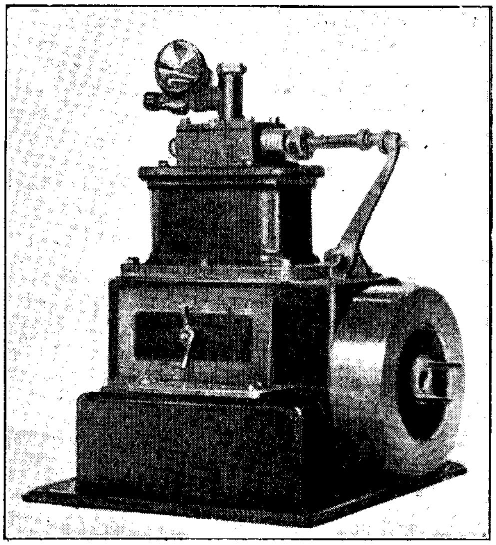


Fig. 5.—Enclosed Single-Acting Twin Engine.

early attempts at casting The cylinders are built up of brass tube, with the valve on top, the exhaust port 'communicating with the space between the two cylinders, which is closed by a brass plate soldered each side, giving the cylinders the appearance of being cast in oae.

The crankcase is built up of sheet brass, bent to shape, riveted at the bottom, the ends filed to shape, angle pieces riveted here and there, which are in turn riveted to the case, the whole being then soldered. To these ends are screwed the hearings, which resembie cylinder covers.

The crankshaft is cut from $\frac{1}{4}$-in. steel plate, and trunk pistons and rods are used as in a motor.

The valve pushrod is worked by a side-faced cam in the case. This is rather an attractive-looking engine, and is enamelled chocolate and green, with red and green lining ; hut the plates I use fail to render the photograph of it quite satisfactorily.

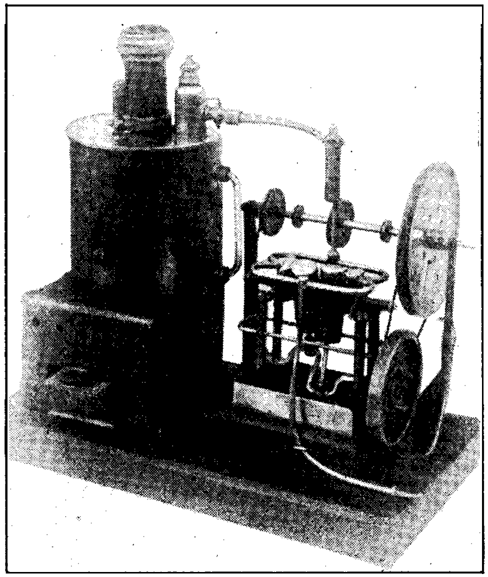


Fig. 6.—The Two-Cylinder Single-Acting Oscillating Engine and Boiler.

Two-Cylinder Single-Acting Oscillating Engine with Boiler.

The smallest enginc and boiler is of a simple type (Fig. 6), and was made for a youthful member of the family. It is a two single-acting oscillating, with cylinders $\frac{3}{8}$ in. by $\frac{3}{4}$ in., which were purchased, and mounted on four 3-16th-in. brass rod columns. The crankshaft is i-in. steel wire bent to shape, and a few meccano pulleys mounted for driving models. The boiler is of 3-in. brass tube, with two flanged ends, and the centre flue, which is of copper, is flanged over top and bottom to form a stay. The funnel and firebox arc of sheet iron. Part of a car valve cap forms the dome, and projects inside the boiler far enough for a brass wire cottar to be fixed. The safety-valve is set to blow off at 15 lbs. A stop valve, whistle, bent tube water gauge, test cock (defunct), and a two-wick spirit lamp completed the outfit, which, in spite of advancing years. is still most energetic.

Signal Lever Frame.

The signal lever frame (Figs. 7 and 8) I made for a model railway which was not to be. There are 24 levers; the bottom parts of sheet brass, and the handles filed up and soldered on, then treated with nickel galvanet. The round plates are paper-fasteners, the legs of which were opened and soldered to the levers.

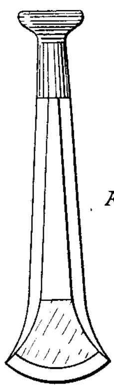
At the foot of the levers there are small rocking levers, the idea being that these rockers would eventually be connected to small indicators in front of the levers.

There is no interlocking gear, or spring catches--the levers merely pull over and spring into a notch. The framework is built up of two lengths of angle brass, and the distance pieces between the levers are pinned and soldered. A bicycle-spoke forms the pin for the levers to work on. The length over frame is 11 ins., and height from bottom of frame to top of levers 5 ins.

Like many modellers, I am keenly interested in railway matters, and my great ambition is to build a model locomotive.

Machines on Stone Bases.

THERE is a good deal to be said in favour of stone blocks for mounting machinery, at any rate in a small shop. Sometimes a machine is required to be moved to some other part of the building, and some rearrangement of the plant is very often necessary.



Chisel used for Chipping Out Bolt Holes in Stone.

When the machine is mounted on concrete, this usually means breaking up the block and mixing fresh concrete. This must be allowed to set, and often valuable time is lost.

With stone the case is altogether different. A couple of rollers are slipped underneath, and away she goes, machine and all intact.

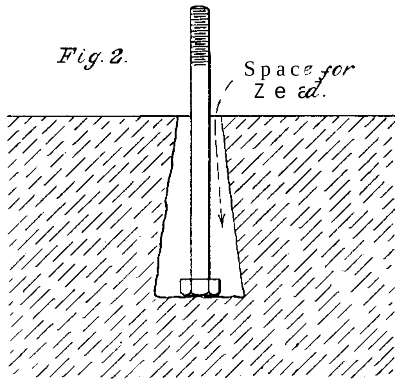
The writer has personal experience of the value of stone blocks for this kind of work. The stones are generally old-fashioned cheese-press weights, which may often be picked up at old farmhouses for a mere trifle.

The writer has bought a splendid cubical sandstone block in this way for two shillings. This block measures two feet each way, and is now carrying a large drilling machine.

Another block of the same kind is now bearing a Darracq motor-car engine, which supplies power to the workshop. This is not even cemented to the floor, but merely sits on the hard earth. There is no trace of vibration with the engine running at full speed.

As to the method of mounting the machine, lay the machine in position on the stone and carefully mark the holes for the holding-down bolts. Then remove the machine and proceed to drill the holes in the following way.

Get a mason's chisel with a point like a half-moon (Fig. 1), and wide enough to clear the bead of the bolt. Light blows only must be



Sectional Sketch showing Holding-down Bolt in Place.

delivered, and the chisel turned round and round as the work proceeds. If you have never done this work before, practise on an old piece of waste stone. The hole must be cleared of dust from time to time with a wire scraper.

When the hole is deep enough, say, five or six inches, the sides must be widened till the bottom of the hole is considerably larger than the top. The purpose of this will be seen presently.

When finished the section of the hole should appear as in Fig. 2. Put in the bolt as shown in the sketch, taking care to have it quite upright, then pour in molten lead to fill the hole.

A word of caution is required here. Be sure the hole is absolutely free from all traces of moisture, or the lead will blow out, and a splutter of molten lead in the face is not a particularly pleasant experience, even if you escape being blinded.

After the lead has set it would be found to rattle slightly, owing to its having contracted. Take a blunt chisel and carefully plug all round the bolt. Treat all the holes in the same way; lift the machine into position and screw it down tight. The holes being wider at the bottom prevents the nut from drawing the bolt out.

Presidential Address

Delivered by Admiral Sir Reginald H. S. Bacon, K.C.B., K.C.V.O., D.S.O., to the Society of Model and Experimental Engineers.

AT the meeting of the Society, held on June 26, the chair was taken by the retiring President, Mr. Basil H. Joy, A.M. I.A.E., who introduced the new President, Admiral Sir R. H. S. Bacon, and vacated the chair in his favour.

Admiral Bacon said :—

Ladies and Gentlemen,-First of all, I must thank you for the honour you have done me in electing me your President for the year. As a model-maker I can claim no special qualifications for that office—in fact, an inspection of the models made by members of your Society fills me with envy and creates in me a dire feeling of humility. However, ! am not prepared to acknowledge a more devoted enthusiast than myself in the pleasures of model-making and the practice of that pastime.

A Model-maker's Difficulties.

Naturally, as an amateur, that is, one who has never served a mechanical apprenticeship, I appreciate to the full the disadvantages under which those who are similarly placed to myself suffer in attempting the difficult art of model-making. It is not merely in the practical use of tools that the amateur is deficient. This may be experienced by any mechanic trained in one trade, hut called upon to practice others in the course of his model-making. What the amateur has missed is the rigid training afforded by apprenticeship in his youth, the dulling of the keen edge of undue hurry, attention to minute and accurate measurements, and he has at a later stage to learn from bitter experience the lesson that it is better to spend hours on laborious and slow fitting and scraping than to hurry and have to devote days to the re-making of a part that he has had to scrap. In fact, whereas the professional mechanic has been taught in his younger and more impressionable days the right way of doing a job, the amateur. by bitter experience, learns the right way only by travelling bye-paths in the wrong direction. As motorists we soon learn that it is better to stick to the main roads instead of trying cross-country cuts. This applies to the workshop. The short-cut generally leads to disaster. As there are dozens of ways that are attractive, but wrong, and as the amateur is apt to sample most of these, enormous patience is necessary to enable that poor person to persevere and to bring a model to satisfactory completion.

Human Peversity.

The perversity of the human mind is beyond belief. How often do not many of us, especially amateurs, although I am not certain that you, masters of the art, will not at times also plead guilty-how many of us, I say, often deliberately do the wrong thing, knowing it to be wrong, with a result disastrous to work or fingers ? and all the time our sub-conscious self --that monitory. voice in the recesses of our minds—was telling us that we were doing wrong? How many of the scars on our fingers should we not in honesty be obliged to own were caused by our knowingly doing a stupid thing, and yet persisting in our foolish ways through inexplicable obstinacy ? And so you see that what with doing the wrong thing, sometimes through ignorance, and at other

The President, 1923.

times through obstinacy, the amateur blunders along his rocky, self-taught, but fascinating road !

Some people imagine that an amateur has unlimited time in which to work and money wherewith to buy tools. There may be such persons, but I have never yet met them-most amateurs have many duties to perform. even if not in regular employment, and the Chancellor of the Exchequer takes good care that tney have little of that annual surplus that perhaps they may have enjoyed in pre-war times. I therefore submit to you, past masters in the art of model-making, that a poor amateur is a person well worthy of your sympathy and encouragement.

What the Armourer Thought of It.

Ever since my early youth I remember looking forward with hope to the construction of a working model; but for more than fifty years of my lifetime I have had neither leisure nor opportunity. For a week or two, many years back, I had some instruction from an old armourer; about the only class of mechanic with which we then came in contact, and very good mechanics they were. Sly chief memory of that lime is concentrated on the day I showed him my first job, of which I was rather proud He stammered badly, and so took a long time to deliver the following criticism, which burned itself into my memory : " If, if 1 had d-d-done th-th-that job I should ex-expect to be k-k-kicked round the l-l-lower deck." Not very encouraging! But enough of such depressing reminiscences!

Why Make Models ?

The question as to the *raison d'être* of model-making is often debated. Occasionally pundits arise who tell us we are doing useless work. That we ought to make models for a purpose, to illustate a principle, or to develop an idea, or to assist in losing our money by taking out patents; just as, in the same way, the modern up-to-date theorist tells us that every play should be a problem play, and that Gilbert and Sullivan's delightful operettas, or " Charlie's Aunt," or even " Charlie Chaplin," are of no account.

Why Play Golf?

The way I answer these people is to ask them, What is the use of go!f? Golf, I believe, is a game in which you pay five shillings to smite at a ball, and then use what the Americans call " cuss words." Well, you can say something emphatic with equal fervency in the workshop, by smiting with a hammer and hitting your finger. Looked at from this aspect the difference between model-making and golf, viewed as recreations, is merely one of degree of intensity of expression. Of course, the fact of the matter is that model-making is a recreation just as much as any game. Individuals of varying temperament take their recreations differentlv. If there were no differences of opinion, variety in fancy waistcoats and ladies' blouses would disappear. Some of us play with balls, and others with lathes and files! Why not ?

The Bo'suns' Recreation.

You may perhaps remember the tale of the old boatswain in the Navy, whose one idea of recreation and enjoyment-after he had retired from the service was to hire a boy to call him at daylight every morning. The boy was to say, " Four o'clock, sir, raining and blowing hard. and the first lieutenant wants you on the foc'le at once! " Then the old man pictured himself enjoying the luxury of rolling over in bed and saying, " Tell the first lieutenant to go to hell! " Well, that was *his* idea of enjoyment. Another man—an American this time—went on his honeymoon trip, but as he had not enough money to take his wife, he left her behind! I knew another man who simply revelled in correcting the dates and statistics in *Whittaker's Almanac* from memory. Also I have heard of one dear old lady whose idea of bliss was studying the Army and Navy Stores list.

Why not Model-making?

Well, if all this variety of recreation, why not model-making ? Why we, of all people, should be forced to combine utilitarianism nith our recreations--we do not insist that each of these persons should introduce realism into their fanciful recreations--we do not insist on the boatswain getting up when he was called-or the Amercan curtailing his honeymoon---or that my friend should only correct statistics of educational value, and leave the others severely alone, or that that dear old lady should ever be obliged to *buy* any thing catalogued in the Stores list she loved to pore over,

Why ? Indeed !

Why, then, should we, model-makers, be singled out and forced to indulge only in recreations that are lucrative or in such pleasures only as are of benefit to our neighbours?

Let us examine the virtues of model-making. We know that model-making is a very old institution. More than three thousand years ago models of all sorts were buried with the great departed, to blossom into realities, and serve their purpose in the world beyond; quite a pleasing idea! and certainly a practice likely to raise the standard of model-making in accuracy of detail, if we had to depend for transport and facilities in a future life on the performance of the models constructed by us here below.

Variety in Model-making.

Again, there is perhaps no recreation which offers a larger field of variety of choice than model-making --any animate or inanimate object can be the subject of a model. Sculpture is used to perpetuate the memory of human beings. From the vegetable world flowers are copied for the adornment of ladies' hats, and the very commonest objects form the subject for children 's toys.

We have utilitarian models to illustrate principles or for advertisement, like those carried about a century and a half ago, before price-lists and catalogues esisted, to illustrate- full-sized articles of furniture. Or. again. those magnificent reproductions of ships, exhibited by shipbuilders and the large ship-owning firms. All these, however, are constructed by the trade, as a business and not as a recreation.

Then, again, we have models that fascinate

the eye, and are exact replicas of the externals of the original, but have no more inside them than the lay figures in a hairdresser's window. These we may classify as mechanical sculptures.

Again, we may elect to construct machines like locomotives or racing boats, which have an exact outside, with an inside adapted Lo propel that outside with the best results, but that inside having no pretence to being an accurate copy of the internal economy of the full-size model. This class of model is perhaps the most fascinating to construct of all, to a person gifted with an active brain, since ingenuity of invention and adaptation have to be exercised as well as mechanical and constructional skill.

In the end we come to the real model of all models, that in which the inside and the outside are all correct in accurate dimension and detail. This must be acknowledged to be the purest form of model work, but it suffers as a recreation from the fact that ingenuity is checked and controlled, being confined merely to the devising of mechanical constructional operations, without scope for improving mechanical efficiency of performance.

Classify Models.

These varieties of models are so distinct as to render it difficult, if not impossible, to compare them, especially with a view to adjudicating awards, and I feel that some definite classification should be established I think that this, the first and leading, Society of Model Engineers has a duty cast upon it to take a lead in formulating such a classification.

I would suggest that the most practical way of so doing would be to collaborate with the promoters of the Model Engineer Exhibition, and send a draft of the scheme formulated to each recognised Model Engineering Society for their remarks. It would ndd to the interest of future Model Exhibitions if exhibits were arranged under such classes. The n-hole subject is too large to deal with adequately in this address. I may, however, call your attention to a fen- of the points involved.

What is a **Model?**

It is necessary to determine first what a model ii. If a full-scale reproduction ran be a model of itself, or if a reproduction larger in scale than unity is a model? The inclusion of statuary and allied modelling can hardly be denied.

Suggested Classification.

Modelling naturally fails under three broad heads, *viz.*, modelling in wood, in metals, and in other materials. Between modeis in wood and metal in many cases we get an overlap. Hence the natural division will fall, as now generally arranged, into models of ship-, models of aeroplanes, and other models, since aeroplanes are of a type distinct in themselves, and ships may largely be of wood or entirely if metal. Other models would generally be of metal only.

The divisions would then be:—

Division I.—General models in metals.
Division II.---Ship models.
Division III.—Aeroplane models.
Division IV.—Sculptures in materials other than metals or wood.

Some further classification such as the following would be necessary:—

Division I.—Class I:

Section A.—Exact scale working models, all portions working and exact.
Section B.—The same, but some small portions, such as pressure gauges, oilers, etc., either not to scale or working.
Section C.—Material varied.

Class II:

Section A.—Exact scale, working models, as regards exterior, all details and materials correct, but inside details varied. Such models being designed for efficiency results.
Section B.—As above, but not for efficiency.
Section C.—As above, but not working.

Class III.—Models not to scale:

Section A.—Utility to demonstrate principle.
Section B.—To obtain efficiency results.
Section C.—Miscellaneous;

and so on for the various divisions.

A double advantage would be gained by classification, since not only would sculptures be distinguished from working mechanism; but, in exhibitions, models of the same class of article would be widely separated and a degree of sameness avoided.

As a discussion of Mr. Maskelyne's paper is to take place later on, this evening, I will not further elaborate this important matter.

Bold Men and the Ladies.

Some bold men have had the hardihood to suggest that model-making at home is good training for the tempers of the lady members of the household. These brave men, I notice, generally hide their identities under a *nom-de-plume*, presumably to avoid home detection.

This is an aspect of model-making that requires delicate handling.

It has been laid down as a maxim that "the hand that rocks the cradle rules the world." This may be so, but if it is I would like, parenthically, to hope that latterly the cradle had been rocked more efficiently than the world has been ruled. By this theory, the mid-European muddle can be accounted for, namely, by ladies trying to do two things at once with the same hand. I would, however, suggest that, in view of the chaotic social upheavals that have taken place in several nations, the wording of the old saying should be altered

to read, "The hand that rules the cradle rocks the world."

Old Dutch.

At this point some badinage between the President and the Vice-President brought up a reference to the super-efficient and time-saving Dutch lady, who was seen rocking a cradle with her foot, reading a book balanced on her knee, knitting a stocking, and pressing a Dutch cheese by sitting upon it, all at the same time, and a suggestion that from some recollections of Dutch ladies, it might be taken for granted that the cheese-pressing was more efficiently performed than either of the other operations. However, let these speculations pass.

Subtlety.

Undoubtedly, female influence is exerted in a very subtle fashion. In nine cases out of ten, however, the small female devices of deft flattery or simulated opposition are seen through by us mere men, and while pretending not to notice them, we capitulate speedily, knowing that sooner or later we shall be obliged to do so.

Honours Easy.

I suggest, on the other hand, however, that the home model-maker is not without his wiles and bribes in the shape of repairs and reconstructions, which sooth ruffles and smooth away objections. It has been suggested that great toleration of noise and untidiness is required on the part of the lady. This undoubtedly is so; but is it any greater than the self-control necessary in the man, who just as completion is approaching and the trial of his model imminent, finds his work-table strewn with ever recurrent hot-water cans, or the débris resulting from a duel between the cook and the mincing machine?

Pride in the Model.

But in the end, the pride taken by the average wife in the completed—I emphasise the word completed—model is generally greater than his own; since he knows better than she does sundry weak spots that may be hidden from the untrained eye. No! home model-making is a case of give and take.

Mutuality.

I advise you ladies, even if there is a little litter and mess occasionally to clear up, to encourage your husbands in the innocent and home-abiding occupation of model-making—of course, duly tempered with household and jewellery repairs—and I further advise the men to take an intelligent interest in the full-scale models, such as jumpers, blouses, and hats, made by your wives, sisters, mothers, cousins, and aunts. You will even find it profitable when journeying by train or 'bus to read what "Madge" or "Violet," or any of those persons who write the "Ladies' Columns" in the daily papers, may have to say of the latest fashions, and so get the technical terms intelligently fixed in your heads. How *can* you, gentlemen, grumble at your family using by mistake a chisel for a screw-driver or a micrometer gauge as a spanner, if you, yourself, are abysmally ignorant of the difference between a "crêpe de chine blouse" and an "eau de Nile jumper"?

Health and Camaraderie.

In conclusion, let me call your attention to two really vital matters as regards model-making. The first is a warning, especially to the busiest and most enthusiastic of your members, not to let model-making become so great an obsession as to interfere with health. Remember that model-making, although a recreation, is also work and labour, and therefore consumes energy. Occasional rest is needful if the machinery of the body is to be kept at a high level of efficiency. Some fourteen years ago I was working very hard at the Admiralty, and spent all my spare time on a large model of the skeleton frame-work of a rigid airship, which at that time I was persuading the Admiralty to build. The result was that I broke down and had to rest for a few weeks. I argued with the doctor that "surely model-making was recreation and therefore a rest to the mind." His answer is well worth remembering. He said, "Yes! just as much rest as standing on the other leg." Remember this.

The last point I touch on is what I think the happiest and brightest point in model-making, namely, the freemasonry that exists between members of that faternity. We are not out to make money, our rivalry is purely friendly, we have no trade secrets, each and every one is willing to impart his experience and to help his neighbour in every way in his power. As long as this spirit continues, we can claim that our recreation is a sporting one in the true sense of that term, and we need have no misgivings as to the future of a recreation whose aims and objects are as disinterested as those which inspire societies such as that of the Model and Experimental Engineers.

Mr. Joy proposed a vote of thanks to Admiral Bacon for the interesting and useful address he had given, commenting specially upon the suggestion as to the classification of models. This was seconded by Mr. W. B. Hart, A.M.I.Mech.E., the Chairman of the Society, and supported by Mr. Percival Marshall, C.I.Mech.E., the founder of the Society, a past President, and always an active worker in its interests, who mentioned the fine piece of work exhibited by the Admiral at the MODEL ENGINEER Exhibition of 1922, and referred with approval to the suggestions for the classification of models. He eulogised the President on the

high grade of his work and on his becoming President of the Society. Persons of his position conferred a great benefit on the Society and on the whole model-making world when they identified themselves in such a prominent manner with model-making and model-making societies. Some people scoff at model-making, but the President showed what was at the back of his mind when he wrote offering a prize at this year's MODEL ENGINEER Exhibition, and said, "I want to encourage the put-c amateur." Mr. A. W. Marshall, M.I.Mech.E., A.M.I.E.E., said that his comments upon Mr. Maskelyne's paper had been made at the previous meeting, but he would like to support the vote of thanks to the President. It was an axiom with institutions that a presidential address was not discussed, but one was permitted to express appreciation. The discussion of Mr. Maskelyne's paper which had taken place that evening should cause their President to go home a happy man, because it was evidence that he had given to them the right kind of address and at the appropriate moment. The address was full of encouragement to model engineers, and it urged a consideration of the classification of models, a very important matter. The Society might well be congratulated upon its choice of President; he had shown by his address that he was precisely the man to occupy that position. The subject of the classification of models, in the speaker's opinion, should have the serious attention of the Society; it was, however, a very difficult one and much involved. They might perhaps remember the answer given by a schoolboy when asked in examination to classify triangles; his answer was, "Triangles are of three kinds, the equilateral or three-sided, the four-sided or square, and the multi-sided or polyglot." How should we try to classify models? Our minds will perhaps be as confused as that of the schoolboy. The address raises the question, What is a model? The term is not easily defined. There is a suggestion that a model may be larger than its prototype; this may appear to be a *reductio ad absurdum*, but it is not so. We cannot well contemplate a model of a locomotive being larger than its prototype but with very small constructions the case is different. For example, the mechanism of a watch: a reproduction, or whatever you may term it, of the escapement might be made to a larger scale than the prototype for the purpose of demonstrating the action; would it be a model? He hoped that the Society would give the matter earnest consideration. The President should not be regarded as a tyro in model-making. Those who had seen the 15-in. howitzer mounting, a wonderful piece of model work, by the President, which gained a bronze model at the MODEL ENGINEER Exhibition of last year, would know that as an amateur model engineer he stood in a high rank indeed. Their President had that evening given encouragement to amateur model engineers. The speaker, in conclusion, commended to all those who were struggling with difficulties, experiencing disappointment or failure, and might be disheartened and weary in their efforts the words of Robert Louis Stevenson, "It is better to travel hopefully than to arrive." Mr. T. Norman Gilbert, the Secretary of the Workshop Committee, congratulated the President on having succeeded, under the stress of present-day conditions, in concluding his address without referring to "wireless." It was certainly an effort of skill and determination.

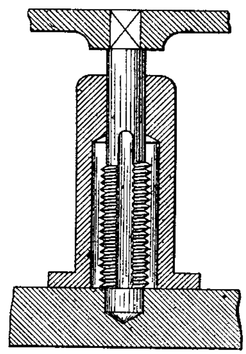
The vote of thanks was carried with enthusiasm and prolonged applause.

Workshop Notes and Notions.

[Short practical notes of workshop interest are invited for this column. Contributions must be based on the sender's own experience, and should be marked "WORKSHOP NOTES" on the envelope. Accepted items are paid for within a few days. Unaccepted notes will be returned if a stamped addressed envelope be enclosed.]

Tap Guidance.

When tapping shallow holes it is difficult to start the tap at right angles to a machined surface, more so when a taper tap cannot be employed due to the hole's shallowness.



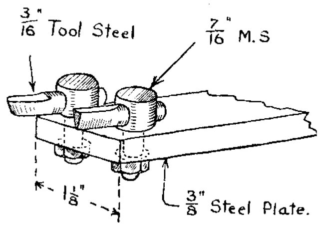
Sketch of Guide for Tapping Shallow Holes.

The above drawing shows a simple form of a tap guidance in section; it is turned from brass or mild steel round bar, and its length over-all being somewhat shorter than the tap, in accordance with the depth of the hole to be tapped.—E. G.

A Labour Saving Toolholder.

Model engineers who realise the value of saving time in making small objects, in which a good many repetition operations are involved, generally use some form of capstan toolholder attachment for their lathes; but for those who do not possess such a device the dual toolholder

illustrated on this page has
As will be seen from the sketch the tool is of a very simple character and consists of a flat piece of steel plate, measuring $1\frac{1}{8}$ in. wide by $\frac{3}{8}$ in. to $\frac{1}{2}$ in. in thickness, and of a convenient length to ensure its firm support in the tool rest. The end of the plate is marked off for tn-o equidistant holes of 7-16th in. in diameter,



A Labour-Saving Too holder.

and is drilled to receive the two toolholders. The latter are drilled through their centres for 3-16in. round tools and these are clamped between the post holes and the plate by means of the nuts shown. By making a series of small tools, for plain turning, facing, parting, screwcutting, etc., the holder can be put to a variety of uses, whilst the usefulness of the two tools held on the lathe at one time will be appreciated by those who normally spend a large amount of time in changing and setting up tools when using **a single tool.-R. T.**

Making Piston Rod Pliers.

Pliers for assembling piston rings can be bought, but are unduly expensive. To get over this difficulty the writer designed a pair of pliers which are simple to make.

The two principal members are made from two pieces of mild steel, $5\frac{1}{2}$ ins. long, 1 in. wide, $\frac{1}{2}$ in. thick, joined together by two plates, X in the illustration. A groove is cut in the handles each side, $\frac{1}{8}$ in. deep, to take the plates. The latter are $\frac{1}{8}$ in. thick, $1\frac{3}{4}$ ins. long, by $\frac{1}{2}$ in. wide, fastened to one handle with two $\frac{1}{8}$-in. rivets, and swivelling on a $\frac{1}{4}$-in. rivet on the other. The plates can be made from cast steel and hardened. or mild steel, in which case they will have to be case-hardened.

A 45° notch is filed at the extremity of each handle, which fits into the slit in the piston ring. Any other form of nose can, of course, be provided to suit the tvpe of ring in use. A plate spring $\frac{1}{4}$ in. wide is fastened on to one handle by a screw and presses against the other.

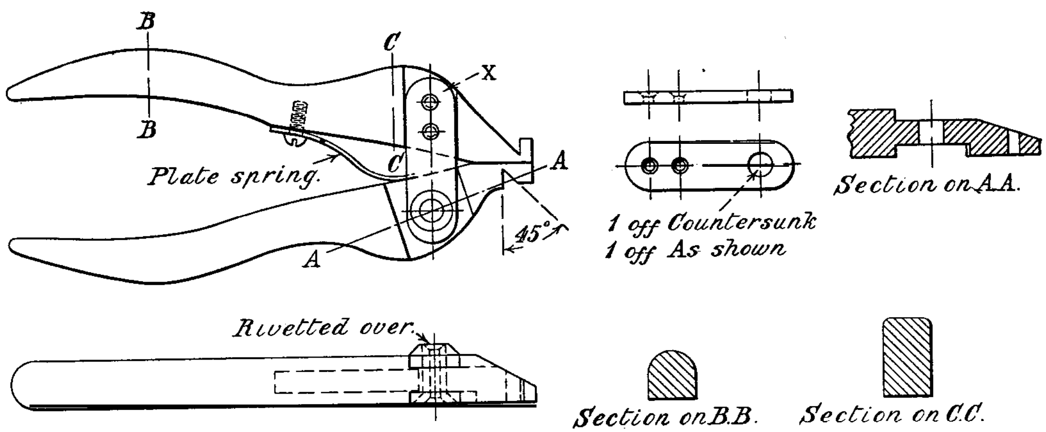
After filing a chamfer at the front end to give clearance, the handle is ready for case-hardening.

To use, open the piston ring sufficiently, so that the ends engage the vee's in the nose of the pliers, then squeeze the handles together with the hand, which opens out the ring, to allow it to clear the outside diameter of the piston. When the ring reaches its groove, the hand is released and the pliers removed.

A. S. BLACKIE.

Whitening for Rapid Drying.

Mix fine powdered whitening with methylated spirits and keep in a bottle. This will cover any incorrect line in ordinary marking, and is also good enough for general marking where centre pops will be used, but, of course, having no glue, will rub off. For hurried work it can be dried over a spirit lamp. It can also be used to cover stains on a ceiling, since it dries without leaving a water-mark at its edge. Of course, for marking bright steel or steel straight from the machine or file without grease on it, sulphide of copper takes a lot of beating.—R. H. BACON.



Sketch and **Details** of Piston Ring Pliers.

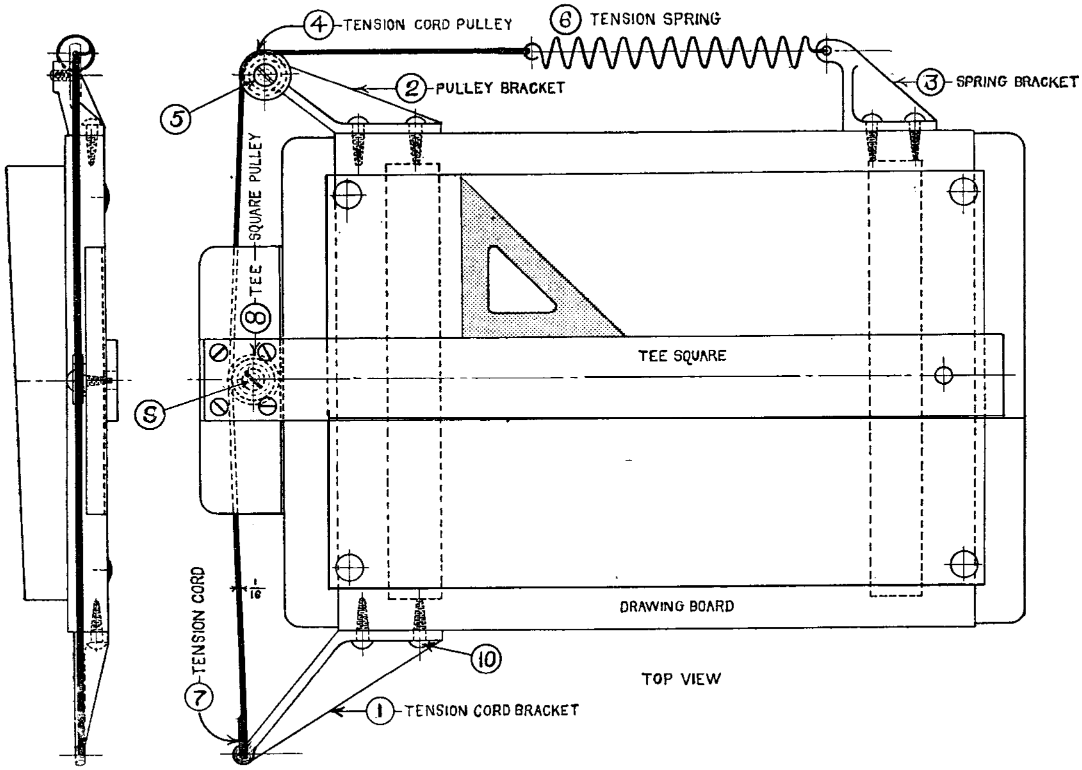
A Semi-Automatic T-Square.

By B. R. Wicks.

The following description with drawings will assist the reader to make a semi-automatic T-square for his drawing-board that will take the place and do the same work as the more expensive kind. Much difficulty is often encountered in keeping the head of the T-square up against the working edge of the drawing-board at all times without some means to hold it in position, but yet to allow it to slide freely up and down on the drawing-board, and when moved not to shift from parallel. By the use of this attachment unsatisfactory results from errors will he avoided, as tne T-square is held to the board by means of the tension cord, Fig. 7, running in pulleys, Figs. 4 and 8, and the proper tension obtained by the tension spring, Fig. 6. The tension cord bracket, Fig. 1; the pulley bracket, Fig. 2, and the spring bracket, Fig. 3, are to be made from bronze castings secured in position on the edges of the drawing-board by screws, Fig. 10. The pulley bracket, Fig. 2, is fitted with a bronze grooved pulley, Fig. 4, and held in position on the boss of the pulley bracket, Fig. 2, so that it will revolve

The T-square pulley, Fig. 8, is made of the same material and the same way as Fig. 4, only it is held in position on the under side of the T-square head by screw, Fig. g. The tension cord, Fig. 7, is best made from silk line about 1-16th in. diameter. It is secured in the eye of the tension cord bracket, Fig. 1, and over the pulley, Figs. 4 and 8 to the tension spring, Fig. 6, as per the drawing.

This attachment has been made and used and it works to perfection.



End View and Plan of Semi Self-Adjusting Tee Square.

Electric Drive for Water Pump.

The following problem is so typical oi many which model engineers are up against that the few practical hints given below will no doubt be useful to a number of our readers. The difficulty is stated in our correspondent's own words:-

" I have a 20—40-volt 20-ampere dynamo driven by a $2\frac{1}{2}$-h.p. oil engine. This plant charges a battery of thirteen So-amp.-hour accumulators for house lighting, at an output of 12—14 amperes. Situate about 120 yards from the above installation I have a pump which

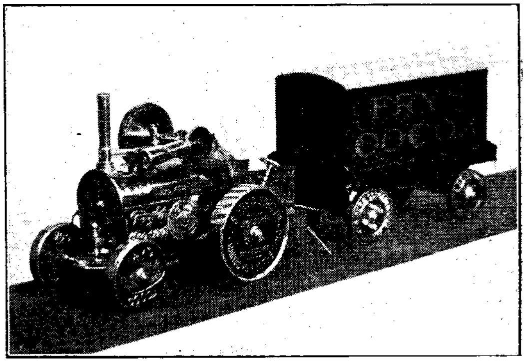
requires $\frac{1}{4}$—$\frac{1}{2}$ h.p. to drive. Is it possible to run two overhead leads to drive a motor connected to the pump by a belt? The pulley on pump is 12 ins. by 3 ins.; speed 200 revolutions per minute. Is it feasible to run the motor direct from the dynamo or battery? What would be the approximate cost of a motor? The pump is worked one hour each day."

The question as to whether the pump could be driven by means of an electric motor depends upon the amount of power required and whether the mechanical construction is adaptable to the purpose. We cannot advise you as to amount of power without knowing the quantity of water delivered per minute or hour, and the height, including suction lift, to which it is delivered. Overhead wires could be used, but should be fitted with a lightning arrester. or else disconnected and earthed when not in use and during a local thunderstorm. The motor, assuming it does not require too much current, could be worked from the battery; the dynamo is probably shunt wound, and may require the field magnet to be compound wound in order to work the motor satisfactorily. This could be ascertained by trial. We suggest that you ask for a quotation from an electrical firm, giving them particulars of the pump and amount of work it is required to do. The size of motor, and consequently price, depends upon the rate of pumping and height to which the water is to be delivered. Your estimate of $\frac{1}{4}$ to $\frac{1}{2}$ h.p. is not sufficiently definite unless you are prepared to take the higher figure. To develop $\frac{1}{2}$ h.p. the motor would take about 500 watts, say, about 20 amperes at 25 volts. This would be a heavy discharge for the battery. It could. however, be reduced by pumping at a slower rate, that is to say, spend two hours or more on the pumping instead of one hour. An electric motor is self-regulating, and takes current in proportion to the work it is doing. A $\frac{1}{4}$-h.p. size could be tried, and if it were found that it was overloaded the rate of pumping could be reduced. From the information given and quoted above we conclude that the matter is quite practicable. An ampere meter should be put in the circuit, so that it can be seen how much current the motor is taking at any time; this will be useful, as it will indicate whether the pump or the motor is working properly. The electricity taken for driving the pump would, obviously, reduce the capacity of the battery for lighting purposes to the extent of the equivalent ampere hours used for working the motor. The pumping might perhaps be done by the dynamo and battery combined just at the end of charging up. By this means the load would be distributed, and need for a compound wound dynamo obviated. When the pumping was effected, the charging could be resumed, and battery brought up to full charge.

Working Models as Advertising Mediums.

Two Working Model Tractors.

WE are indebted to the builder of these two tractors—which are something in the nature of curios on account of the materials employed in their construction—Mr. W. H. Webb, for the illustrations accompanying these notes. The little models, which were recently shown at a meeting of the Bristol S.M.E. (of which Mr. Webb is a member), were awarded the 2nd Prize in one of the Society's competitions, as already recorded in our pages. There is nothing special to be said about them, the builder tells us, except that they work continuously well and without mess. The boilers are



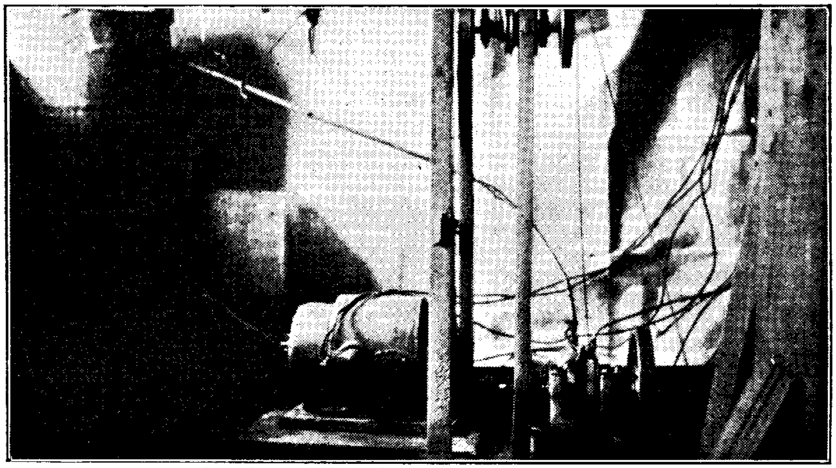
One of the Tractors and its Load.

of sheet copper and are $5\frac{1}{2}$ ins. long, stayed with a central brass rod. Each has three water tubes. The wheels need no explanation except to say they have hardwood centres and are shod with brass bands secured with brass countersunk shoemakers' rivets. The hubs are from the threaded tubes which belong to the inner tubes of cycle tyres. The power unit is in each case a single oscillating cylinder. For the driving gears clock-wheels are used, a train on four shafts comprising this. Steering gear is fitted to both tractors, and cartridge cases are used for funnels. Methylated spirit lamps with asbestos wicks are provided for steam raising. One of the engines is fitted with electric light, the battery being carried under the trailer. The builder advocates the wider adoption of such-like models to advertise the goods and name of the firm whose tin cans or containers are made into components for the models. We understand Messrs. J. S. Fry & Sons, whose name appears on the wheels of the engines, sent one by Mr. Webb to Australia some time back, when it was usefully exhibited by the firm at shows at Sydney, and in New Zealand.

A Fourth-Floor Paraffin Engine.

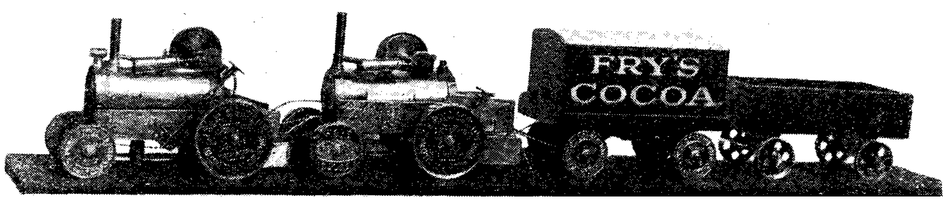
By DAVID LYALL.

I AM in possession of a small power paraffin engine which I think would satisfy the most fastidious. It was designed and made three years ago by a local engineer named A. D. Rankine, and has given me complete satisfac-



Where the Internal Combustion Engine sometimes gets to.

tion, and I think has done everything an engine of its size could do. This machine can be seen working by any reader who cares to come up to my address, as it is in use every day. "Link-head's" engine shook the place even when fixed on a concrete base; mine is held to the floor by



For description] Two Working Model Tractors Used as Advertising Mediums. [see page 108.

four ordinary screws and works over a dwelling-house. I am four store-s up. As for running too hot, my trouble is more in the opposite direction. The carbon deposit left in the cylinder is quite soft. I scrape it off with a piece of brass or any metal that will not score the iron. The engine can tick over at anything from 220 revs. per minute and keep on doing it. I think I can say with confidence this is the smallest engine in Ayr that works for its living. Any reader who would like more details than I have given below I will gladly furnish through the columns of the MODEL ENGINEER. I use it for polishing all kinds of metals, and it also drives a dynamo which keeps the cells charged for gilding, plating, and ignition, and lights the shop in winter.

I will now try and give a general idea of its construction and working. The ignition is electrical. At first I had a heavy coil, which worked well on 4 volts, but when the points burned off I put a Ford in its place; this, however, did not work well on 4 volts, but on 8 it never fails. I have after a year's working with it needed one set of new points, costing 1s. 6d. Contact is made by a 3-16th-in. screw a on coming contact with a piece of stout clock-spring insulated from the engine. The screw can be slackened so that it

can be set to fire at any point. This gives a spark every revolution, but, as there is no combustible in the cylinder at the time the extra one occurs, there is no harm done. I have had equal success with Lodge, Apollo, and Champion plugs. The best are those that can come to **pieces** and be cleaned. The carburetter is the ordinary jet type with a cork float coated with shellac.

The opening and closing of the throttle is a vertical motion, and can be opened with a foot-pedal. A spring takes it back to a position determined by a screw, which can be set with the finger and thumb, so that the engine can be left ticking over until needed, and, as the load is applied when polishing, the throttle can be opened with the foot. This acts as a governor. When charging or lighting it is set with the screw.

and works without chattering. Over the three years it has cost me a new exhaust valve spring, 2 plugs, 3 sets coil points. I never actually put it on a consumption test, but a gallon does all that is necessary in the workshop, including the engine, for 7 to 10 days.

It could be said it is made in 5 parts—

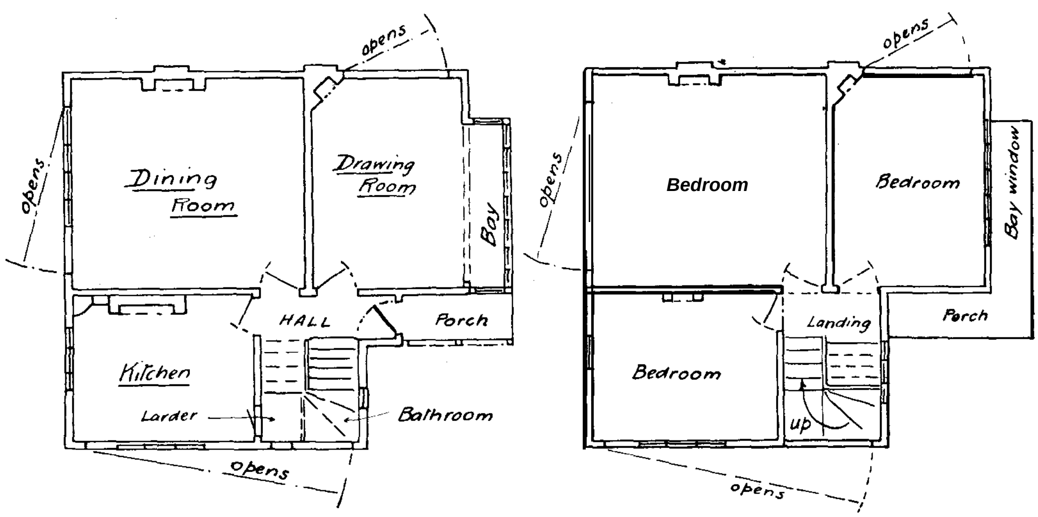
(1) The body, which carries the crankshaft, half-time gear make-and-break and 2 fly wheels.

(2) The cylinder.

(3) The cylinder cover, which carries the exhaust valve and vaporiser, which is an extension and is $1\frac{1}{2}$ in. long and 1 in. in diameter. Into this is screwed sparking plug (metric thread).

(4) The inlet valve and carburetter.

(5) The piston, connection rod, big end and little end.



For description] The Ground Floor and First Floor Plan of a "Working" Model **House.** [*see page* 111.

A small jet of gas plays on the vaporiser for three or four minutes before starting ; this eliminates the use of petrol.

The dynamo I have is a 12-v. 15-a., but the most I ever have occasion to use is 12-v. 6-a. This I can get quite easily. On dark days, or when making gilding solution, it works almost all day. The impulse stroke is noticeable in the lights, but not enough to be annoying. It is very simple in construction and is water-cooled. After the water connections are removed, the removal of 4 screws and 2 nuts allows the whole thing to come to pieces and be cleaned. It can be stripped, cleaned out, and running again inside 30 mins. All joints are metal to metal ; no soft packing whatever is used. I have always treated the faced parts as if they n-et-e delicate children, but I consider I have been amply rewarded, as I never have had the slightest trouble with them. The inlet valve is automatic

The cylinder is cast iroa with a wrought iron jacket shrunk on ; water space about $\frac{1}{4}$ in. The piston cast iron, flat head, holbow gudgeon pin ; the bearings are brass, white metal lined.

The principal measurements are : Length over all, 22 'ins. ; 'breadth between flywheels, 8 ins. ; bore 2 ins. ; stroke, 3 ins. ; compression, about 45 lbs. per square inch; exhaust valve head, $\frac{3}{4}$ in.; exhaust valve length, $2\frac{3}{4}$ ins. ; inlet valve head, $\frac{3}{4}$ in. ; inlet valve length, $2\frac{3}{4}$ ins.

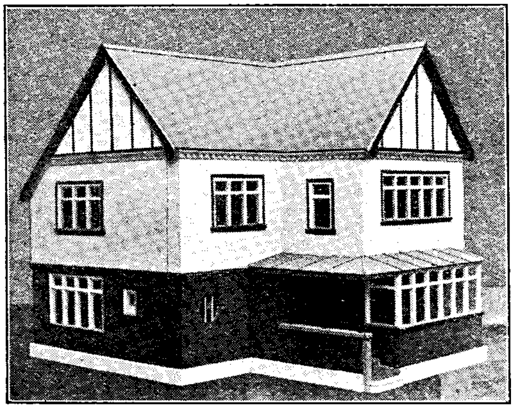
This engine is not on model work, but is part of the shop plant; it has to answer when called upon. When I think of " Linkhead's " steam engine, and try to picture it working where mine is, four storeys up, I have to smile, although I have no doubt it does all he says it cam do, but up here it would be useless. The photograph herewith may help to make my explanations clearer.

A Model House

For a "M.E." Reader's Daughters.

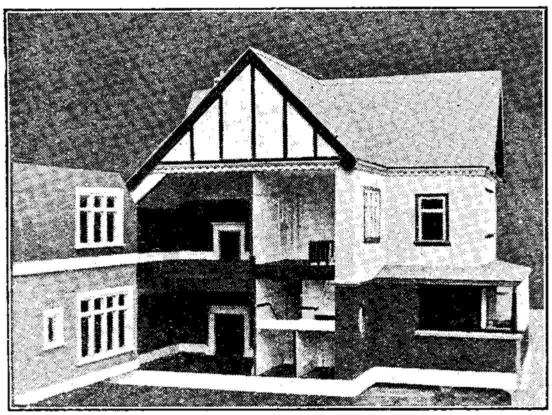
By HENRY GREENLY.

THE model house was recently built by Messrs. Mills Bros., of Sheffield, to a plan prepared by the writer for an old reader of this journal. He desired to have something more realistic



Exterior View of the Houses.

than the doll's house provided by the average toy trader. The scheme of the house is shown in the accompanying drawings. The rooms are split up, so that openings can be made in the sides without entirely destroying the architectural effect of the structure, the front of the



One Portion Opened, shcaing Interior Arrangement.

house not being interfered with. With minor additions, the prototype of the house is one which could be lived in, which is more than can be said for the orthodox toy.

The interior is well fitted up. Metal grates are provided. The doors are properly panelled and embellished with handles and finger plates. The system of panelling is the same as that designed by the writer for model railway carriages, machined parts for which are now one of the products of the above firm. The mode! is about 3 ft. 6 ins. square.

Society and Club Doings.

Secretaries are notified that all notices of forthcoming meetings must reach us 10 days previous to date of publication of any given issue.

Model Engineering.

The S.M.E.E.

FORTHCOMING MEETINGS.—At Caxton Hall. So meeting in August. On Thursday, September 20, the annual rummage sale. On Tuesday, October 16, regular meeting. On Wednesday, November 7, nominations; and on Wednesday, December 5, A.G.M.

COMPETITIONS.—Challenge Shield, Classes A, B, and C; Bronze Medal Trophy; and the Small Lathe Competition.

VISITS.—On Sunday next, the 29th inst., City and South London Underground Railway, tunnel enlargement works, Moorgate to Angel section. On Friday, August 24, all day, Southampton, to inspect Cunard R.M.S.S. *Berengaria*, including the engine-room. On Thursday, Septemper 13, half-day, D. Napier & Sons, Ltd., Acton, Motor Works. On Thursday afternoon, September 27, Royal Mint. The numbers are limited, and the lists will close early, as definite arrangements have to be made beforehand. Therefore register at once. Special tickets for the Southampton visit will be supplied by the Secretary.

TREASURER, Mr. A. J. R. Lamb, Room 173, Windsor House, Victoria Street, Westminster, S.W. I.

WORKSHOP.—No rummage sale in August or September. Now is the time to get work done. while the attendance is slack, and it is a good opportunity 'to work through the books in the library.

Full particulars of the society, with forms of application for membership, etc.. may be obtained from the Secretary, F. H. J. BUNT, 31, Mayfield Road, Gravesend, Kent.

Manchester S.M. & E.E.

FORTHCOMING MEETINGS.—July 17, Model night; August 7, Model night; August 21, Mr. Wright on "Tempering." All meetings start 7.30 p.m. prompt.

R. STUART NICHOL, Hon. Sec., 405, Stretford Road, Manchester.

Society of Model Aeronautical Engineers.

FORTHCOMING EVENTS.— On Saturday, July 28, at 4 p.m., on Wanstead Flats, Open Competition for THE MODEL ENGINEER

Cllallenge Cup. This is a rise-off-the-ground event for fuselage models, rubber-driven. The prizes are (I) Sliver medal and the winner to hold the Cup for the year; (2) 2nd Class Diploma; (3) 2nd Class Diploma.

The Victoria M.S.C.

Bathing Lake, Victoria Park, E.g.

Sunday, July 15, was an easy day, although the members' attendance was at average.

Recruiting still in progress : **Mr.** F. Galley has joined the happy crew as an active member.

The speed section of the club are rolling their sleeves up. Many specimens of H.P. engines are to be seen in all directions, which, not many days since, were in the rough, and in not many clays to come will be in action.

Mr. W. F. Curtis, one of the club's earliest members, who has recently returned from Southern climes, has offered a handsome silver cup for speed and endurance.

This season's events and Trophies are the largest in the annals of the club. Power-boat enthusiasts are invited to join us to make the competitions as keen as ever.

July 29.--Nomination Race for the Bigg Cup. (Present holder, Mr. W. *Moss.)*

John G. Philpot, Hon. Secretary, 115, Richmond Road, Barnsbury, N.I.

Ramsey M.Y.C.

which took place on Tuesday evening, July been postponed from Tynwald xvere more being, there best, a smooth water. The course was from starting one, a quarter of a mark opposite the Queen's to and thriw round. Hourtrcn part in the contest, :Ind t"1e result xvas :--

I, I-'io+zeer, Mr. C. Kinrnde; 2, .Ilnrtd. Xr. 11. Ho\xrlnnd; 3, AIelody, Mr. J. Smith.

The arrangements \vere \ve!l carried out ?)y A. Christian, Esq., J.P., of the Club, and Mr. J. J. Dailey, Hon. Secretary-.

News of the Trade.

Rotary Transformers and Rectifiers.

An illustrated list has just been issued by Messrs. M. W. Woods, 15 and 16, Railway Approach, London Bridge, S.E.r, containing particulars relating to the small rotary rectifiers and transformers thev are now manufacturing at their Gloucester Tvnrks. The "M.W." rotnrv rectifier is made in a number of different outputs, ranging from I or 8 volts and 3 amperes to 30, 50, or 7; volts and 15 to 20 amperes. It runs on supr>ly pressures of 100 to 250 volts and 50 to 60 cycles, and is intended for use in the home or garage for charging accumulators. It consists of a small syncnronous AC. motor fitted with a two-part commutator, interrupting at such a point in the A.C. wave-curve that full wave rectification is obtained by fitting three brushes, with a brush rocker of the movable type. The rectifier is mounted on top of a cast-iron box, complete with auto-transformer, 2-way switch, and cut-out. Suitable switchboards can also be supplied when required. These have a slate panel upon which is mounted voltmeter, ammeter, D.-P. switch, two S.P. fuses, cut-out, and sliding resistance. Larger sizes for electrolytic work, plating, and cinema arc lamps, etc., nre also made to meet customers' requirements. Other periodicities can be provided for at a slight extra charge. In 3-phase circuits a sctond commutator is necessary, but gives an extra smooth and efficient output. Alternatively, it can be worked off one phase of the 3-phase supply, which is usually good enough in the smallest sizes. The rotary transformer is for pressures of 100 to 250 volts D.C., and is a self--contained machine with doubly-wound armature and commutators at either end. The spindle runs in ball bearings.

Notices.

The Editor invites correspondence and original contribution on all small power engineering, motor and electrical subjects Matter intended for publication should be clearly written on one side of the paper only, and should invariably bear the sender's name and address. It should he distinctly stated, when sending contributions, whether remuneration is expected, or not, and all MSS. should be accompanied by a stamped envelope addressed for return in the event of rejection. Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All subscriptions and correspondence relating to sales of the paper and books to be addressed to Percival Marshall & Co., 66, Farringdon Street, London, E.C.4. Annual Subscription, £1 1s. 8d. post free to all parts of the world.

All correspondence relating to Advertisements and deposits to be addressed to THE ADVERTISEMENT MANAGER, "The Model. Engineer," 66, Farringdon Street, London, E.C.4.

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Contents.

The asterisk ( ) denotes that the subject is illustrated.